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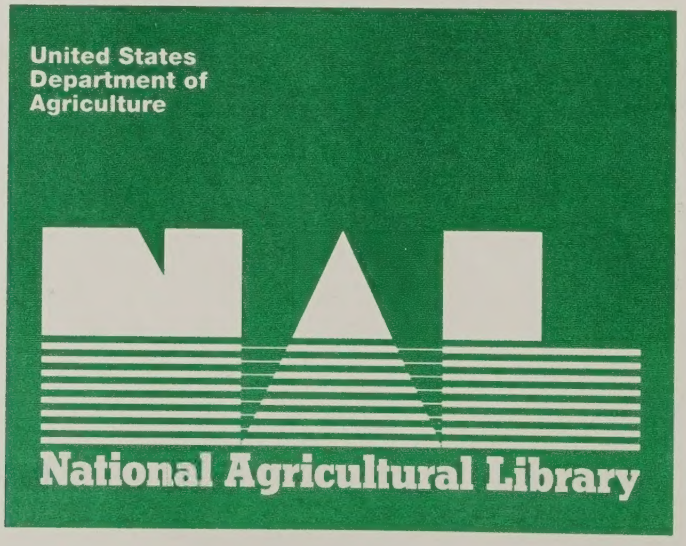
Review of Existing and Alternative Federal Dairy Programs

REVIEW OF EXISTING AND ALTERNATIVE FEDERAL DAIRY PROGRAMS, Economic Research Service, U.S. Department of Agriculture. Staff Report No. AGES840121.

ABSTRACT

Real milk prices 15-20 percent lower than in 1983 would approximately balance production and consumption under conditions projected for the dairy industry during the remainder of the eighties. Government purchase, storage, and disposal could effectively stabilize prices near this level, but these are wasteful means of raising prices and, thereby, enhancing producers' incomes. Other programs such as direct payments, supply control, and price discrimination can transfer income to farmers at less cost to society in the short run, but can lead to serious inefficiencies over time. Changes in the marketing order program to bring prices charged to processors and paid to producers more in line with the value of the services associated with the milk would contribute to the efficiency of the industry.

Keywords: Dairy programs, milk pricing, price supports, milk marketing orders, supply control.



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PREFACE

The Agriculture and Food Act of 1981 called upon the U.S. Department of Agriculture (USDA) to submit to Congress a dairy program operation report "describing the strengths and weaknesses of existing Federal programs, and the consequences of possible new programs, for controlling or minimizing surpluses of fluid milk and the products thereof."[1/] The President had earlier initiated a Government-wide program of regulatory review to examine the effects of Federal programs on economic efficiency, costs, and productivity.[2/] This report responds to the congressional mandate and addresses regulatory issues in the area of milk marketing of concern to the Administration.

This study deals with dairy programs for the eighties. It describes the longer term effects of major program alternatives rather than the effects of specific program proposals. The study is oriented toward decisions regarding:

Level of price and income support.

Mechanisms for price and income support.

Supply controls.

Degree and nature of Government involvement in setting prices for milk through marketing orders.

Each of these major decisions involves many subordinate and related decisions addressed in the report.

The study was conducted by a team of research economists in USDA's Economic Research Service (ERS) and from two universities. Team members included Richard Heifner, ERS, team leader; Kenneth Baum, ERS; Richard Fallert, ERS; Edward Jesse, ERS; Howard Leathers, University of Wisconsin; James Miller, ERS; Andrew Novakovic, Cornell University; Larry Salathe, ERS; and Felix Spinelli, ERS. Serving as advisors to the study team were Joel Blum, Agricultural Marketing Service; William Dobson, Purdue University; Carol Harvey, Foreign Agricultural Service; Mary Kenney, Agricultural Marketing Service; Alden Manchester, ERS; Charles Shaw, Agricultural Stabilization and Conservation Service; Tom Stafford, Agricultural Cooperative Service; and John Witzig, Statistical Reporting Service. The advisors made many useful suggestions during the course of the study, but are not responsible for the content of the final report.

1/ Public Law 97-98, 97th Congress, Section 107, Dec. 22, 1981.
2/ Executive Order 12291, Federal Register, Vol. 46, No. 33, Feb. 19, 1981, pp. 13193-13195.

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EXECUTIVE SUMMARY

Balancing milk production with use under conditions projected for the remainder of the eighties will call for real milk prices 15-20 percent lower than in 1983. The actual price levels needed will depend heavily upon feed costs, profitability of other farm enterprises, and off-farm employment opportunities for farmers. If 15-20 percent reductions in dairy farmers' prices are deemed unacceptable, income could be transferred to farmers by setting price supports at higher levels and disposing of surpluses, or by other types of programs. All impose economic losses of one type or another on society. The Federal milk marketing order program, which sets minimum prices that handlers must pay for milk according to its use, also leads to certain inefficiencies. These can likely be reduced by adjusting some of its provisions.

This study describes the economic effects of the dairy price support program and the Federal milk marketing order program and explores the likely impacts of alternative programs. Alternatives considered include eliminating programs, lowering supports, supply control, direct payments, and various changes in marketing orders. Effects of these alternatives on milk production, prices, economic efficiency, and other aspects of industry performance are examined.

Price supports provide a high degree of income certainty for dairy farmers, enabling them to invest in productive cows and efficient facilities and equipment. But recent high support levels have stimulated production of about 10 percent more dairy products than consumers will buy at the support price. Such surpluses waste resources and impose high costs on taxpayers and consumers. Eliminating or sharply reducing dairy price supports would do away with the surpluses and high government costs, but subject the industry to greater price variability and uncertainty. Price and production cycles similar to those that exist for beef and hogs might well emerge. Excessive fluctuations likely can be prevented by extending supports at lower levels that would more nearly balance production and use. Any lowering of supports should be gradual to avoid severe shocks to the industry.

Other types of programs which have potentials for transferring income to farmers without attracting excess resources into milk production include supply control and certain types of direct payments. Supply control involves using some incentive other than milk price to motivate farmers to limit marketings. It is basically a means of transfering income from consumers to persons who hold the rights to produce milk. Possibilities include paying farmers to reduce marketings below a base and a two-price system with a lower price for excess production. Payments for reducing marketings could be financed by assessments on the remaining output. A two-price system might be financed by using revenues from an assessment on excess production to subsidize disposal operations. Either scheme requires quotas or production bases on individual farms. These production rights take on monetary values. Rules must be established and enforced regarding their transfer and entry into the industry. Supply control is best viewed as a temporary measure.

Dairy farmers' incomes could be augmented by direct payments based either on current or historical production. The former would amount to a subsidy of milk consumption; Goverment costs would be very large. The latter would give money to

producers without distorting production, but involves problems of determining eligibility much like a supply control program.

Any support program for dairy producers requires a price or income standard. The parity index, which has served this function in the past, sometimes gives price signals which over- or under-stimulate production. Possibilities for developing a better standard include basing it on costs specific to dairy, adjusting for changes in productivity, and adjusting for the size of Government removals.

Federal marketing orders, which regulate over two-thirds of the milk produced in the United States, lend regularity and a degree of price certainty to fluid milk markets. This is accomplished through classified pricing: charging higher prices to handlers for milk consumed as fluid than for milk made into manufactured products. Orders allocate revenues to farmers based on an average or blend price. They also assure fair dealing and maintain conditions favorable to farmers' cooperatives.

Classified pricing leads to inefficient resource use if price differentials exceed cost differences or if the blend prices paid to farmers do not reflect the value of services that farmers or their cooperatives perform. It can be used to transfer income from fluid milk consumers and Grade B producers to Grade A producers and manufactured product consumers. In most orders the price differentials between uses are maintained above the order minimums by cooperatives' over-order charges. Whether the differentials exceed costs is difficult to ascertain. However, the net loss to society from excessive price differentials appears relatively small, in the neighborhood of 1 percent or less of the value of milk produced.

Reconstitution of milk from dried and concentrated ingredients offers a means for supplying a fluid milk product to consumers in high cost-of-production areas at a lower price than fresh milk. By forcing fluid distributors to, in effect, pay fluid use prices for manufactured ingredients used in reconstitution, Federal marketing orders remove incentives to use this technology. However, if ingredients for reconstitution were priced at manufacturing milk prices, the current classified pricing system would be jeopardized. The possibilities for making commercially reconstituted products available to consumers at prices reflecting actual costs while at the same time providing producers a degree of price certainty and stability deserve consideration.

Eliminating Federal milk marketing orders would expose the fluid milk industry to much uncertainty. The outcome would depend heavily on whether the large full-service cooperatives could maintain some form of classified pricing in the various marketing areas. If not, a period of substantial turmoil and readjustment would likely occur, driving some producers and processors out of the business.

Possibilities for improving milk pricing under the Federal order system include (1) pricing milk to processors more in line with costs and (2) paying producers or their cooperatives in accord with the services they provide. Class price differentials to processors appear too large in some areas and too small in others. Once total production and use are brought into balance, efficient pricing for milk would generally call for approximately equal prices from west to east across much of the country and prices that increase from north to south with transportation costs.

Among the alternatives that have been suggested for distributing marketing order pool revenues more nearly in accord with the services that farmers and their cooperatives provide are special payments for hauling or balancing, and pooling receipts among producers at more than one level in each marketing order. Distributing revenues based upon services performed would increase marketing efficiency, but determining the value of such services is difficult.

GLOSSARY

Capper-Volstead Act: A Federal law passed in 1922 which permits farmers to act together in associations to collectively market their products which in the absence of such enabling provision could result in antitrust actions against them. The Act assigns to the Secretary of Agriculture responsibility for determining if such associations unduly enhance price through monopolization or restraint of trade.

Class I milk: Grade A milk used to produce fluid milk products under a Federal marketing order.

Class II milk: Grade A milk used to produce soft manufactured products, usually including fluid cream, ice cream, cottage cheese, and yogurt, under a Federal marketing order with three classes; Grade A milk used to produce any manufactured dairy product under a Federal marketing order with only two classes.

Class III milk: Grade A milk used to produce cheese, butter, canned milk, and dry milk under a Federal marketing order with three classes.

Fluid grade milk: See Grade A milk.

Grade A milk: Milk produced under sanitary standards that qualify it for fluid consumption.

Grade B milk: Milk not meeting Grade A standards; less stringent standards generally apply.

Manufacturing grade milk: See Grade B milk.

Manufacturing milk: Grade B milk or Grade A milk assigned to Classes II or III or otherwise used in the production of a manufactured product.

Market-clearing prices: Prices that in the absence of monopoly or government controls equate production of a product with commercial use over a period of time.

Milk marketing order: A regulation issued by the Secretary of Agriculture or a State official which specifies minimum prices and conditions under which milk can be bought and sold within a specified area.

Minnesota-Wisconsin (M-W) price: Average price per hundredweight paid to farmers for Grade B milk in Minnesota and Wisconsin as estimated by USDA.

Over-order payment: A payment charged by a producers' cooperative in excess of the minimum price specified by a marketing order; usually applies to Class I milk.

Price surface: A set of geographic price relationships which are analogous to elevations above a plane.

Thin markets: Markets generally characterized by few potential traders and few or infrequent trades.

INTRODUCTION

The U.S. dairy industry has relied on Government programs for half a century to support farmers' prices and incomes, expand consumption, and lend stability and orderliness to prices and markets. The programs operated without major problems during much of this period. But, on several occasions, surpluses brought on at least in part by the programs have been burdensome. Such is the case in the early eighties as Government costs for surplus removal exceed $2 billion annually.

Costs to Government are not the sole concern with current dairy programs. Some groups maintain that the programs lead to inefficiencies in production and marketing that result in higher than necessary retail prices for dairy products. Many dairy farmers find their returns are less than needed to cover costs. Some members of society view with concern the shrinking numbers of dairy farms and the diminished opportunities for young farmers. Some see a need to reduce Government intervention in the economy.

Dairy policy has been the subject of many previous studies by universities, the USDA, and other institutions.[1/] This study brings together the results of these past works, describes current conditions and prospective developments in the dairy industry, and examines effects of existing programs and possible alternative programs in light of expected developments. The focus is on the longer run aspects of dairy policy, looking particularly at program alternatives for the remainder of the eighties.

The study describes strengths and weaknesses of existing dairy programs and consequences of possible new programs. Impacts of programs on economic efficiency, stability, income distribution, adequacy of supply, and other broad indicators of performance are assessed in qualitative terms. Where feasible, quantitative estimates of the effects of alternative programs on milk production, price, Government costs, and other variables of interest to farmers, industry decisionmakers, consumers, and policymakers are presented. Regional differences in program impacts are described where they can be detected.

Five interrelated Federal programs with different legislative histories are in use. This study deals mainly with:

> Dairy price supports which maintain a floor under all farm milk prices through Government purchases of manufactured dairy products.
>
> Milk marketing orders which establish marketing rules and minimum prices that milk handlers must pay producers for fluid grade milk in areas where producers have voted to have orders.

Three other programs are treated in less detail:

> Import controls which protect the price support program and keep the U.S. Government from supporting world milk prices.
>
> Federal cooperative policy which encourages the development of farmer-owned cooperatives but prohibits use of market power to raise prices too high.

1/ For a list of recent studies dealing with dairy programs, see Dash in References section.

Distribution programs, some that subsidize increased consumption of dairy products and others that give away at home or abroad products acquired in price support operations.

The economic effects of extending, modifying, and eliminating these programs are described. Also considered as possible alternatives are two types of programs not traditionally used for milk in the United States:

Supply control which involves special incentives to farmers for limiting milk production or marketings.

Direct payments from the Government to farmers as a means of income support.

The support price undergirds the entire price structure for milk sold by farmers to processors. Price support is achieved through Commodity Credit Corporation (CCC) offers to buy butter, nonfat dry milk, and cheese at prices designed to return the support price to manufacturing grade (Grade B) milk producers, on average. This provides a floor under the price of milk used to manufacture these products and, indirectly, supports the price of all milk.

Federal milk marketing orders set minimum prices which must be paid by processors to farmers for fluid grade (Grade A) milk. Milk going into fluid use is priced higher than fluid grade milk going into manufactured products. Proceeds from both fluid and manufacturing sales are pooled and all producers in each pool are paid the same average or blend price subject to adjustments for location and deductions for marketing services. Approximately two-thirds of the milk marketed in the United States is covered by Federal orders.

This combination of price supports and marketing orders is found only in the dairy industry. Marketing orders are in effect for many fruits, vegetables, and specialty crops, and there are price supports for basic commodities. But fruit and vegetable marketing orders do not establish an institutional structure for pricing, as do milk orders; their effects on prices are achieved through restraints on grade, size, and quantities marketed.

In some cases, the need for Government involvement in the dairy industry, as in other industries, arises from observable imperfections in markets. Examples are information inadequacies or monopolistic conditions in markets for milk or related goods and services. Perishability of milk makes dairy farmers and processors particularly vulnerable to imperfect competition, market uncertainties, and price variability. Hence, many dairy program provisions are designed, at least in part, to lend price certainty and stability to markets.

Government has intervened in the dairy industry to change market outcomes for other purposes, including redistributing income and protecting or aiding certain groups. In determining the need for such programs, policymakers must resolve certain basic issues. Are producers' prices and incomes to be raised above average levels that could be expected under longrun market-clearing conditions? Do we want to subsidize milk consumption because of nutritional considerations? Are we willing to pay higher prices for dairy products in order to have more small dairy farms than are needed? Is regional self-sufficiency in fluid milk production to be encouraged? These are all questions about tradeoffs between different program goals. To answer any one of them "yes" implies a willingness to use

Government programs for purposes beyond simply providing price certainty and stability and assuring fair trading.

Perhaps the largest issue to be resolved is whether programs are to be used to raise dairy farmers' incomes above the average levels that would prevail under longrun market-clearing conditions. Indications are that some net benefits to society are available through programs which reduce instability and uncertainty and prevent destructive forms of competition. Over time, many gains from such programs accrue to consumers. In contrast, measures designed to directly raise farmers' incomes generally do so at the expense of consumers and taxpayers.

Differences in views about the nutritional value of increasing milk consumption, the desirability of maintaining small farms, and the desirability of regional self-sufficiency in milk production lie behind much of the debate on dairy programs. Each of these has implications for program selection. These goals can generally only be attained at some cost to taxpayers or consumers.

Bringing milk supply and demand into balance requires about 10 percent fewer dairy cows than exist in 1983, probably followed by further gradual reductions during the remainder of the eighties. A very sensitive issue concerns where the needed adjustments in cow numbers will occur. These reductions can come from dairy farms leaving the industry or from reducing the number of cows per farm. The latter route would increase production costs in the long run.

Concerning marketing orders, several additional issues are important: whether there should be more or less Government involvement in administering prices; whether order prices should be adjusted or other provisions changed to more nearly reflect costs and encourage more efficient movement of milk into fluid and manufacturing uses; and to what degree order provisions should encourage growth and development of farmer cooperatives.

ECONOMICS OF THE U.S. DAIRY INDUSTRY

Milk is a bulky, highly perishable commodity subject to bacterial and other contamination. It must be produced and handled under sanitary conditions and marketed quickly, either for use in fluid form for direct consumption or transformed into storable manufactured dairy products. Price is the fundamental coordinator of activities in milk production, assembly, processing, and distribution. Prices allocate raw milk supplies among competing demands and give dairy farmers and processing and marketing firms production and marketing signals.

The ability of market prices to efficiently coordinate activities depends in part on the inherent characteristics of milk and its products. Government involvement in the dairy industry is partly intended to overcome certain problems created by these characteristics. Most of these factors are not unique to milk; but, in combination, they create unique problems for the industry. Important characteristics of milk and the dairy industry include:

Extreme perishability of the raw product, with a high potential for transmitting diseases. This requires rapid product movement, refrigeration, heat treatment, or other means to prevent bacteriological growth.

Highly inelastic demand.

Bulkiness. However, its bulk is caused by its high water content (87 percent) and, therefore, can be reduced.

Exceptional nutritional qualities. Milk is high in protein and essential minerals and vitamins. It does, however, contain saturated fats which may contribute to circulatory diseases in some people.

Production through a continuous biological process, creating (among other effects) a need for skilled workers every day of the year.

Unsynchronized seasonality of production and demand.

Biological lags in output and inelastic supply in the short run.

Substantial upward trend in milk production per cow.

Joint assembly and hauling for most dairy farmers.

Many producers selling to relatively few middlemen.

Relatively high investment in specialized buildings and equipment.

Requirements for specialized management skills, especially on large operations.

Output of milk varies daily and markedly so seasonally, while consumers' fluid milk purchases exhibit a strong weekly pattern and a seasonal pattern roughly opposite that of supply. This means that supply cannot be tailored exactly to fluid demand, even if the demand were known with precision. A reserve of milk is needed to meet fluid demand on any given day.

Significant costs exist in producing and marketing milk for fluid use that are not present in supplying milk for manufactured products. These additional costs must be covered to compensate farmers and marketing firms for meeting the sanitary requirements and providing the reserves needed to serve the fluid market.

Costs of transporting fluid milk and its products (such as cream and butter) vary widely. Manufactured products can generally be transported for a small fraction of the cost of transporting an equivalent amount of fluid milk. Thus, geographic areas of competition vary for the different products. Butter and cheese are sold in a national market, while fluid milk is mostly consumed within a few hundred miles of where it is produced.

These characteristics lend instability to milk markets. Milk pricing and marketing programs are used to deal with this instability.

Milk Production Subsector

Dairy farming occurs in every State, as does the processing of almost all dairy products (fig. 1). However, in 1982, 50 percent of total U.S. milk was produced in five States: Wisconsin, California, New York, Minnesota, and Pennsylvania. Nearly 66 percent of the total milk supply was produced in the top 10 States. Large drylot dairy farms with 1,000 to 2,000 cows are common in Florida and the

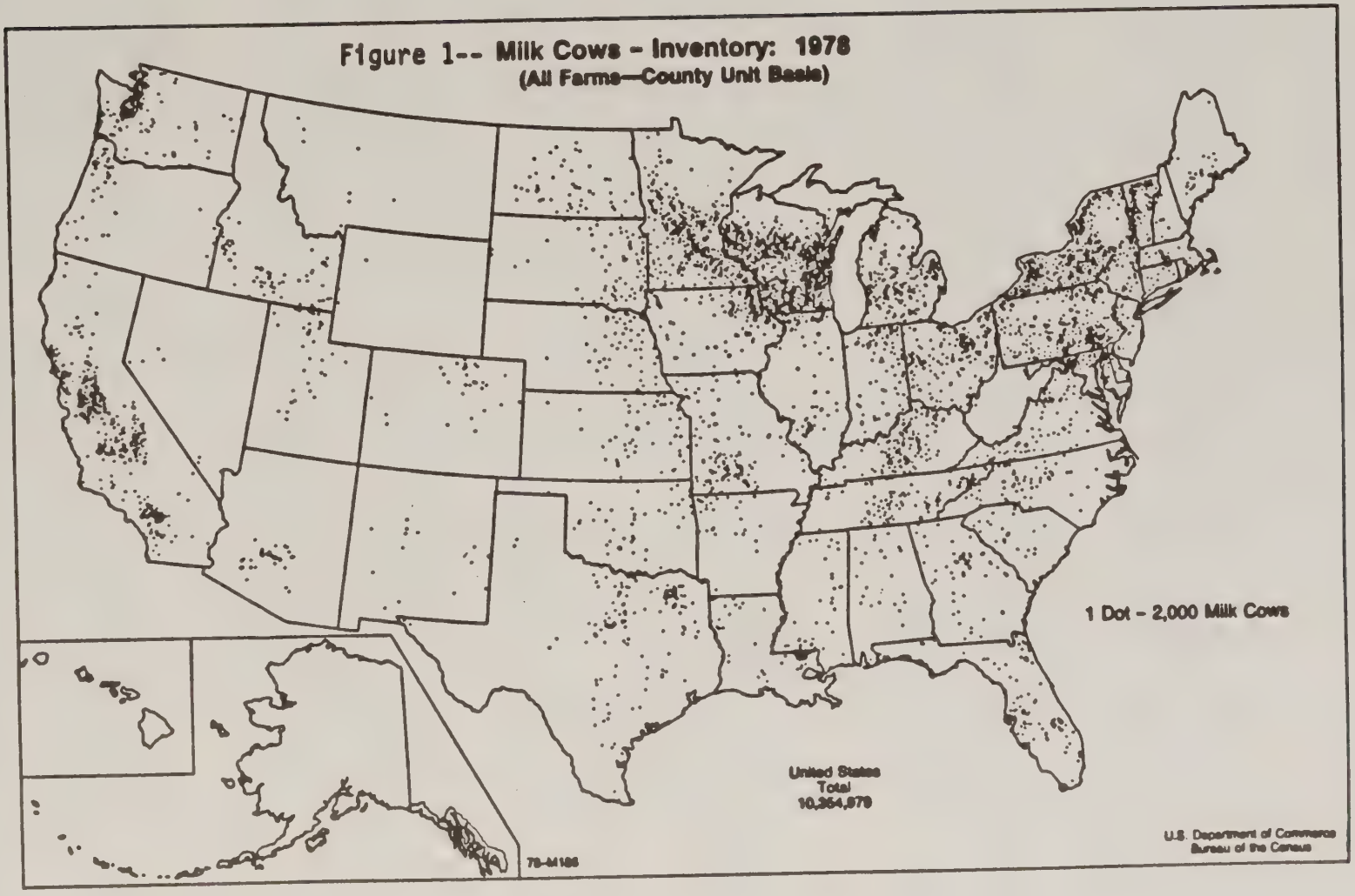
Figure 1-- Milk Cows - Inventory: 1978
(All Farms—County Unit Basis)
1 Dot = 2,000 Milk Cows
United States
Total
10,354,979
78-M166
U.S. Department of Commerce
Bureau of the Census

southwestern States. Dairy operations of this size are virtually nonexistent elsewhere, where a 100-cow herd is considered large (table 1).

Structure

The number of farms with milk cows declined from nearly 2 million in 1959 to 312,000 in 1982. Commercial dairy farms declined from 602,000 to under 200,000 over the same period. The number of milk cows declined from 17.9 million in 1959 to 10.7 million in 1979, but then rose to 11.0 million in 1982. An 80-percent increase in milk production per cow has enabled production to more than keep up with commercial needs.

Dairying has become very specialized with an almost fourfold increase in the number of cows per farm. Ninety-two percent of all milk sales came from farms receiving at least 50 percent of their farm cash receipts from the sale of milk in 1978. The dairy enterprise provided 93 percent of the cash receipts on these farms, many of which include subsidiary forage or feed grain enterprises; but, even this is less predominant than in the past.

Productivity

Milk output per labor hour has been increasing about 11 percent annually in recent years. Although this is due in part to less efficient farms going out of business, productivity has also been raised by substantial inputs of capital and increased milk production per cow. Through improved breeding, feeding, and management, milk output per cow has increased over 20 percent during the past decade (table 2).

Labor productivity gains in dairy farming compare favorably with other agricultural enterprises. Output per dairy labor hour has more than doubled in the past decade, while the increase for all farmwork was around 50 percent. Only poultry showed a sharper increase in labor efficiency during the past 10 years.

Herd testing programs provide a powerful tool for evaluating management techniques and designing breeding and culling programs. Increased participation has helped raise milk output per cow. In 1982, 3.4 million milk cows were enrolled in the Dairy Herd Improvement (DHI) and other official dairy recordkeeping plans. This represented about 30 percent of the total U.S. dairy herd, compared with about 19 percent in 1970 and 10 percent in 1960. Milk cows under official dairy record-keeping plans in 1982 averaged 15,134 pounds of milk, about 23 percent above the 12,316-pound national average.

Supply Adjustment

Because of the biological nature of milk production, taking 2 years from birth until a heifer enters the milking herd, major supply expansion is a long-term process. Contraction of milk supply is similarly retarded by the heavy fixed investment in specialized facilities and lack of alternative farm and off-farm opportunities for dairy farmers in some major dairy States. Changes in feeding and culling rates can alter milk production to a limited extent in the interim period, but these factors are generally quite stable in the aggregate. Because of these production lags, supply is relatively inelastic (unresponsive to price) over a period of 1 or 2 years. However, milk supply tends to be more elastic in the long run. Most of the inputs--feed concentrates, labor, and equipment--can

Table 1--Dairy herd size distribution on farms with milk cows, by region, 1978

Region 1/	Herd size (number of cows)								Average herd size	
	1-4	5-19	20-49	50-99	100-199	200-499	500+	All sizes	All farms	Farms with 5 or more cows
	Number of farms								Number of cows	
New England	2,764	847	2,917	2,279	647	117	5	9,576	40	55
Middle Atlantic	19,986	8,648	22,777	13,410	2,968	441	20	68,250	33	47
Corn Belt	25,255	11,208	20,267	8,914	1,676	169	11	67,500	24	39
Lake States	4,390	13,154	40,939	12,598	1,316	117	3	72,517	34	36
Plains	9,650	3,952	6,484	2,438	451	63	2	23,040	21	35
Southeast	9,188	1,088	819	1,183	846	363	147	13,634	36	107
South Central	28,900	5,281	4,284	4,385	2,142	535	52	45,579	22	57
Mountain	9,771	888	820	870	473	165	29	13,016	19	71
Southwest	3,182	301	228	396	713	1,034	528	6,382	143	283
Northwest	8,134	1,253	1,660	1,665	919	320	40	13,991	31	71
United States 2/	121,220	46,620	101,195	48,138	12,151	3,324	837	333,485	31	48
	Percent of farms									
New England	28.9	8.8	30.4	23.8	6.8	1.2	0.1	100.0	--	--
Middle Atlantic	29.3	12.7	33.4	19.6	4.4	.6	*	100.0	--	--
Corn Belt	37.4	16.6	30.0	13.2	2.5	.3	*	100.0	--	--
Lake States	6.1	18.1	56.4	17.4	1.8	.2	*	100.0	--	--
Plains	41.9	17.1	28.1	10.6	2.0	.3	*	100.0	--	--
Southeast	67.4	8.0	6.0	8.7	6.2	2.6	1.1	100.0	--	--
South Central	63.4	11.6	9.4	9.6	4.7	1.2	.1	100.0	--	--
Mountain	75.1	6.8	6.3	6.7	3.6	1.3	.2	100.0	--	--
Southwest	49.8	4.7	3.6	6.2	11.2	16.2	8.3	100.0	--	--
Northwest	58.1	9.0	11.9	11.9	6.5	2.3	.3	100.0	--	--
United States 2/	36.4	14.0	30.3	14.4	3.6	1.0	.3	100.0	--	--
	Percent of milk cows									
New England	1.2	2.5	26.3	39.4	21.6	8.2	0.8	100.0	--	--
Middle Atlantic	1.5	4.3	33.8	38.4	16.4	5.0	.6	100.0	--	--
Corn Belt	2.3	8.0	39.2	34.9	12.5	2.6	.5	100.0	--	--
Lake States	.3	6.9	53.6	31.5	6.4	1.2	.1	100.0	--	--
Plains	3.1	9.4	41.2	31.7	11.1	3.3	.2	100.0	--	--
Southeast	2.9	2.0	5.4	16.9	22.6	20.7	29.5	100.0	--	--
South Central	4.6	5.1	14.1	30.3	27.3	14.3	4.3	100.0	--	--
Mountain	6.2	3.3	10.8	24.2	24.8	18.6	12.1	100.0	--	--
Southwest	.6	.3	.8	3.1	11.3	35.8	48.1	100.0	--	--
Northwest	2.9	2.9	12.6	26.6	27.8	20.2	7.0	100.0	--	--
United States 2/	1.9	5.2	31.9	30.2	14.9	9.0	6.9	100.0	--	--

* = Less than 0.1 percent.

-- = Not applicable.

1/ New England: Conn., Maine, Mass., N.H., R.I., Vt. Middle Atlantic: Del., Md., N.J., N.Y., Ohio, Pa., Va., W.Va. Corn Belt: Ill., Ind., Iowa, Ky., Mich., Mo. Lake States: Minn., Wis. Plains: Kans., Nebr., N. Dak., S. Dak. Southeast: Fla., Ga., N.C., S.C. South Central: Ala., Ark., La., Miss., Okla., Tenn., Tex. Mountain: Colo., Mont., Nev., N. Mex., Utah, Wyo. Southwest: Ariz., Calif. Northwest: Idaho, Oreg., Wash.

2/ Excluding Alaska and Hawaii.

Source: 1978 Census of Agriculture, Vol. 1, Parts 1-51, Chap. 1, Table 20.

Table 2--Milk production and factors affecting supply, United States, selected years, 1955-83

Year	Milk cattle on farms, January 1 1/			Milk cows on farms, average during year	Milk production		Average prices received by farmers per 100 pounds		
	Milk cows and heifers that have calved	Milk cow replacements; heifers 500 pounds and over			Per cow	Total	All milk, wholesale	Milk eligible for fluid market	Milk, manufacturing grade
		Total	Per 100 cows						
	- - Thousands - -		Number	Thousands	Pounds	Mil. lb.	- - - Dollars - - -		
1955	21,320	6,832	32.0	21,044	5,842	122,945	4.01	4.53	3.15
1960	17,650	5,686	32.2	17,515	7,029	123,109	4.21	4.70	3.25
1965	15,380	4,780	31.1	14,953	8,305	124,180	4.23	4.63	3.34
1966	14,490	4,450	30.7	14,071	8,522	119,912	4.81	5.17	3.97
1967	13,725	4,215	30.7	13,415	8,851	118,732	5.02	5.43	4.06
1968	13,115	4,080	31.1	12,832	9,135	117,225	5.24	5.67	4.22
1969	12,550	3,990	31.8	12,307	9,434	116,108	5.49	5.87	4.45
1970	12,091	3,880	32.1	12,000	9,751	117,007	5.71	6.05	4.70
1971	11,909	3,843	32.3	11,839	10,015	118,566	5.87	6.19	4.86
1972	11,776	3,828	32.5	11,700	10,259	120,025	6.07	6.38	5.08
1973	11,622	3,872	33.3	11,413	10,119	115,491	7.14	7.42	6.20
1974	11,297	3,941	34.9	11,230	10,293	115,586	8.33	8.66	7.13
1975	11,220	4,087	36.4	11,139	10,360	115,398	8.75	9.02	7.63
1976	11,071	3,956	35.7	11,032	10,894	120,180	9.66	9.93	8.56
1977	10,998	3,887	35.3	10,945	11,206	122,654	9.71	9.96	8.70
1978	10,896	3,886	35.7	10,803	11,243	121,461	10.58	10.79	9.65
1979	10,790	3,932	36.4	10,743	11,488	123,411	12.03	12.23	11.10
1980	10,779	4,158	38.6	10,810	11,889	128,525	13.05	13.21	12.05
1981	10,860	4,345	40.0	10,919	12,177	133,013	13.76	14.94	12.73
1982 2/	11,012	4,532	41.2	11,026	12,316	135,795	13.59	13.73	12.66
1983 2/	11,066	4,532	41.0	11,086	12,531	138,917	13.56	13.72	12.62

See footnotes at end of table.

Continued--

Table 2--Milk production and factors affecting supply, United States, selected years, 1955-83--Continued

Year	Dairy ration cost		Milk cow cost		Grain and other concentrates fed to milk cows 3/		Utility cow prices per cwt.
	Value per 100 pounds	Milk-feed price ratio 4/	Price received per head	Milk required to buy a cow	Per cow	Per 100 pounds of milk produced	
	Dollars	Pounds	Dollars	Cwt.	- - Pounds - -		
1955	3.16	1.08	146	36	1,758	30.1	10.99
1960	2.92	1.15	223	53	2,259	32.2	15.31
1965	3.03	1.18	212	50	2,953	36.7	14.44
1966	3.15	1.30	246	51	3,000	37.6	17.83
1967	3.23	1.35	260	52	3,374	38.3	17.22
1968	3.10	1.47	274	52	3,519	39.1	17.94
1969	3.15	1.54	300	55	3,726	40.7	20.29
1970	3.28	1.53	332	58	3,979	42.4	21.32
1971	3.44	1.49	358	61	4,070	42.4	21.62
1972	3.52	1.52	397	65	4,298	41.9	25.21
1973	4.88	1.28	496	69	4,389	43.4	32.82
1974	6.23	1.22	500	60	4,384	42.6	25.56
1975	6.25	1.31	412	47	4,357	42.1	21.09
1976	6.30	1.37	477	49	4,545	41.7	25.31
1977	6.20	1.39	504	52	4,709	42.1	25.32
1978	6.08	1.53	675	64	4,803	42.8	36.79
1979	6.68	1.55	1,040	87	5,070	44.1	50.10
1980	7.42	1.48	1,190	92	5,260	44.2	45.73
1981	8.02	1.44	1,200	87	5,330	43.9	41.93
1982	7.45	1.53	1,110	82	5,380	43.9	39.96
1983	7.89	1.45	1,035	76	N/A	N/A	39.35

N/A = Not available.

1/ Prior to 1965, estimated by Livestock Section, Economic Research Service.

2/ Preliminary or estimated.

3/ On farms where milk or cream was sold. Beginning 1966, data are for all farms where milk was produced.

4/ Pounds of 16 percent protein ration equal in value to 1 pound of milk.

be acquired in greater volume for dairy production at modestly higher prices. Roughage appears to be an exception and a limiting factor for expanding milk production in some areas. The relatively elastic supply for longer periods, combined with inelastic demand (a decrease in retail price will be accompanied by a less than proportional increase in consumption), can lead to milk production cycles and variability in milk prices.

Regional Revenues, Costs, and Returns

Farmers' price, production costs, and net returns to owned inputs varied greatly among regions (table 3). In 1982, for example, total cash expenses were as low as $9.02 per cwt. in the Upper Midwest, and as high as $11.48 in the Southern Plains. Net returns to owned inputs were highest in the Upper Midwest and lowest in the Appalachia and the Southern Plains regions at $5.61, $4.38, and $4.40, respectively. Residual returns to management and risk were lowest in the Corn Belt (60 cents per cwt.) and highest in the Pacific region ($3.20 per cwt.).

Feed costs were higher in the Appalachian, Southern Plains, and Pacific regions, and lowest in the Upper Midwest. In contrast, ownership costs were relatively high in the Corn Belt and Upper Midwest, and lowest in the Pacific and Southern Plains regions; these differences are due chiefly to housing requirements stemming from relatively harsh climates.

Trends in Dairy Farm Income

Total operating income and expenses more than doubled in current dollars from 1971 to 1980 for typical Wisconsin and New York farms involved in recordkeeping projects (table 4). Net operating income in current dollars increased for both States over the 10-year period, but real net income remained fairly level in Wisconsin and declined in New York. Real net income for Wisconsin was highest in 1979 but declined in 1980. The 1979 peak in real net income for New York farms was below levels of the early seventies. Net operating income includes a return to operator and family labor, management, and equity. The Wisconsin farms, averaging 41 cows, 260 acres of land, and 197 acres of cropland, are typical of the Minnesota-Wisconsin (M-W) region. New York farms, with 46 cows, 200 acres, and 149 acres of cropland, are representative of farms in most of the Northeast dairy regions and, to an extent, other areas dependent on purchased feed concentrates.

Propensity to Produce Milk

Specialization allows each area to produce those goods and services for which it has the greatest comparative advantage. Data are not available for comparing trends in milk production costs by State across the country. Much can be learned, however, by examining State trends in milk production relative to milk price changes among States over time. A large proportional increase in production relative to the change in price generally suggests that a State is gaining in comparative advantage for milk production. Based on this concept, indexes of relative milk production, relative milk price, and propensity to produce milk have been constructed for the States (table 5).

The relative production and relative price indexes measure changes from 1967-69 by State relative to the United States. The "propensity to produce milk" index

Table 3--Milk production costs and returns, by selected cost and returns items, by regions and the U.S., 1982 1/

Item	Northeast	Upper Midwest	Corn Belt	Appalachia	Southern Plains	Pacific	All regions 2/
			Dollars per cwt 3/				
CASH RECEIPTS							
Milk	13.85	13.21	13.37	13.89	14.60	13.27	13.52
Cull cows, calves, & replacement sales	1.10	1.38	1.09	.95	.93	.86	1.14
Total cash receipts	14.95	14.59	14.46	14.84	15.53	14.13	14.66
CASH EXPENSES							
Feed	4.56	3.82	4.52	5.37	6.31	5.79	4.58
Other variable expenses	2.94	2.40	2.82	2.99	2.96	2.54	2.68
Total variable expenses 4/	7.50	6.22	7.34	8.36	9.27	8.33	7.26
Total fixed expenses 5/	2.12	2.80	2.64	2.16	2.21	1.71	2.35
Total cash expenses	9.62	9.02	9.98	10.52	11.48	10.04	9.61
Receipts less cash expenses	5.33	5.57	4.48	4.32	4.05	4.09	5.05
Capital replacement	1.59	1.87	1.84	1.44	1.24	.79	1.58
Receipts less cash expenses and replacement	3.74	3.70	2.64	2.88	2.81	3.30	3.47
ECONOMIC COSTS							
Variable expenses 4/	7.50	6.22	7.34	8.36	9.27	8.33	7.26
General farm overhead	.60	.51	.41	.36	.35	.35	.48
Taxes and insurance	.31	.38	.35	.30	.27	.15	.32
Capital replacement	1.59	1.87	1.84	1.44	1.24	.79	1.58
Allocated returns to owned inputs:							
Operating capital (equity)	.17	.16	.17	.18	.20	.21	.17
Other nonland capital	1.05	1.16	1.17	.94	.71	.65	1.03
Land	.76	.43	.60	.43	.20	.07	.35
Unpaid labor	1.56	1.94	1.98	1.10	.80	.38	1.55
Residual to management and risk	1.41	1.92	.60	1.73	2.49	3.20	1.92
NET RETURNS TO OWNED INPUTS	4.95	5.61	4.52	4.38	4.40	4.51	5.02

1/ Preliminary. States within respective regions where dairy farmers were interviewed: Northeast (NY, PA, OH, NEW ENGLAND), Upper Midwest (MN, WI, MI, SD), Corn Belt (IN, IL, IA, MO), Appalachia (KY, TN, VA, NC, GA), Southern Plains (TX), Pacific (CA, WA).

2/ Weighted average.

3/ Hundredweight of milk represents all milk sold and consumed on the farm.

4/ Includes feed, hired labor, fuels and electricity, machinery and equipment repairs, milk and livestock hauling, marketing, veterinary and medicine, supplies, and artificial insemination.

5/ Includes taxes and insurance, general overhead, and interest paid on land and nonland capital.

Table 4--Operating income, operating expenses, and net operating income on the basis of current and 1967 dollars for selected types of dairy farms, Wisconsin and New York, 1970-82

Item	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
						Dollars							
Wisconsin (41 cows):													
Total operating income	34,805	37,831	39,425	42,764	48,568	49,661	61,987	62,756	66,500	88,481	91,315	N/A	N/A
Total operating expenses	20,319	22,797	22,726	25,517	29,915	32,453	39,089	42,083	43,360	55,611	59,290	N/A	N/A
Net operating income (current dollars)	14,486	15,034	16,699	17,247	18,653	17,208	22,898	20,673	23,140	32,870	32,025	N/A	N/A
Net operating income (1967 dollars) 1/	12,488	12,425	13,359	12,968	12,603	10,688	13,469	11,359	11,867	15,120	12,975	N/A	N/A
New York (46 cows):													
Total operating income	40,000	42,680	42,031	48,552	53,620	55,299	64,661	63,318	73,533	88,171	97,216	98,447	98,513
Total operating expenses	22,619	26,453	26,406	35,106	39,133	41,639	46,427	48,257	55,835	65,603	73,923	76,160	79,352
Net operating income (current dollars)	17,381	16,227	15,625	13,446	14,487	13,660	18,234	15,061	17,698	22,568	23,293	22,287	19,161
Net operating income (1967 dollars) 1/	14,984	13,411	12,500	10,110	9,789	8,484	10,726	8,275	9,076	10,381	9,438	8,182	6,628

N/A = Not available.

1/ Deflated by the Consumer Price Index (CPI) for all items (1967 = 100).

Source: "Wisconsin Farm Business Summaries" and "Dairy Farm Management Business Summaries," University of Wisconsin and Cornell University, respectively.

Table 5--Propensity to produce, relative production, and relative price indexes, by State, 1982 1/

State	"Propensity" Rank	"Propensity" Index	Relative production index	Relative price index
New Mexico	1	228	227	99
Arizona	2	217	189	87
Nevada	3	155	143	92
Washington	4	151	142	94
California	5	139	142	102
Utah	6	133	132	99
Georgia	7	133	113	85
Florida	8	129	117	90
Pennsylvania	9	125	114	92
Texas	10	123	109	88
Oregon	11	122	119	98
Idaho	12	120	135	113
Vermont	13	118	109	92
Maine	14	115	104	90
North Carolina	15	115	98	86
Virginia	16	111	100	90
South Carolina	17	110	96	87
Arkansas	18	104	103	99
Colorado	19	103	100	97
Michigan	20	102	98	96
Maryland	21	100	89	89
Wisconsin	22	99	111	111
Tennessee	23	98	95	97
New York	24	97	93	96
New Hampshire	25	96	87	90
Delaware	26	96	85	88
Connecticut	27	96	81	85
Louisiana	28	93	79	86
Ohio	29	91	86	95
Montana	30	86	83	97
Indiana	31	85	83	98
Massachusetts	32	82	73	89
West Virginia	33	82	73	89
South Dakota	34	82	95	116
Kentucky	35	80	82	103
Wyoming	36	79	78	98
Oklahoma	37	79	78	99
Mississippi	38	79	72	91
Missouri	39	77	81	106
Minnesota	40	77	89	116
Alabama	41	72	62	87
Illinois	42	70	73	105
Kansas	43	66	69	104
North Dakota	44	66	74	112
Iowa	45	64	72	114
Nebraska	46	63	70	111
New Jersey	47	57	52	91
Rhode Island	48	54	48	89

1/ The "propensity to produce milk" index is the relative production index divided by the relative price index. Figures may not divide exactly because of rounding.

The relative production index is:

$$\frac{\left(\begin{array}{c}\text{State's milk prod. in year t}\\ \text{Total U.S. milk prod. in year t}\end{array}\right) \div \left(\begin{array}{c}\text{State's avg. milk prod. in 1967-69}\\ \text{U.S. avg. milk prod. in 1967-69}\end{array}\right)}{} \times 100$$

The relative price index is:

$$\frac{\left(\begin{array}{c}\text{State's all milk price in year t}\\ \text{U.S. all milk price in year t}\end{array}\right) \div \left(\begin{array}{c}\text{State's avg. all milk price in 1967-69}\\ \text{U.S. avg. all milk price in 1967-69}\end{array}\right)}{} \times 100$$

measures changes in production relative to changes in farm milk price over the same period.

The data generally show that the growth in milk production has been greatest relative to price change in the Southwest, Washington, Florida, Georgia, and Pennsylvania, and least in the northeastern industrial States, the Corn Belt, and the Plains. Milk prices increased most in Minnesota, Wisconsin, and the Corn Belt. This is primarily due to the manufacturing grade milk price increasing relatively more than the fluid eligible (Grade A) milk price. In spite of increasing milk prices in these States, their proportion of total U.S. milk production has declined over time. In contrast, the proportion of U.S. milk production from States in the Southwest and West has increased rapidly, even though the price received by farmers in these areas has declined compared with the U.S. average. This suggests a relative lowering of costs of production in these areas, less favorable alternative farm and off-farm opportunities, or other milk production stimulating forces. Data in a separate study give a much more detailed picture of the relative volumes of milk production among States and the trends over time in farm milk prices, milk production, and in the propensity to produce milk (Fallert and Reed, 1984). Most forces affecting location of milk production have been at work for a number of years, and there have been few recent surprises.

Demand for Dairy Products

Milk demand is composed of demands for many products--primarily fluid milk, cheese, butter, and nonfat dry milk. The roles of the various dairy products in the diet differ as do trends in their use. Thus, the demand for raw milk depends on the product mix at a given time and the demand characteristics of individual products.

Changes in Commercial Use

Per capita commercial use of all dairy products has shown little trend since 1970 (table 6). This is in sharp contrast to the downward trend of more than 1 percent annually during the sixties. Total commercial disappearance in 1982 was almost 13 percent greater than in 1970.

Per capita fluid milk sales have trended downward by 2.5 pounds (about 1 percent) per year, reflecting a 6.9-pound drop in whole milk use partially offset by a 4.4-pound increase in sales of lowfat milk. Sales of skim milk per person were steady while cream sales edged higher. The shift from whole milk to lowfat milk has released substantial amounts of milkfat for use in butter.

The downtrend in fluid milk sales was accelerated during the seventies by changes in the age distribution of the population. The population bulge representing the post-World War II "baby boom" has moved beyond the peak milk consuming ages to the lowest consuming age bracket.

Regional differences in fluid milk consumption trends are due largely to shifts in population. Northern markets (particularly east of the Mississippi River) had substantial declines in sales during recent years, while southern and western markets posted significant gains. Differences in per capita sales among markets

Table 6--Indexes of per capita commercial use of selected dairy products, 1971-82[1/]

Item	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
	Index (1970=100)											
Whole milk	97	95	90	85	84	80	76	74	71	68	65	63
Lowfat and skim milk	110	121	131	137	151	160	170	175	180	188	193	205
Cream	99	100	102	102	104	104	103	104	105	106	108	113
Total fluid items	99	100	98	95	97	96	95	94	92	91	90	88
Butter	96	93	91	97	99	97	88	91	83	91	89	85
Nonfat dry milk[2/]	98	87	106	84	66	73	67	61	65	61	53	52
American cheese	103	110	115	122	115	129	127	135	138	132	138	138
Other cheese[3/]	107	121	129	136	140	152	155	168	173	181	183	188
All dairy poducts[4/]	98.5	100.8	99.5	99.1	98.7	99.9	98.7	99.9	100.0	98.0	98.2	99.3

1/ Domestic disappearance derived from commercial sources except for "all dairy products" which is commercial disappearance of all milk on a milk-equivalent, fat-solids basis.
2/ Excludes that used in other dairy products
3/ Excludes cottage cheese.
4/ Includes manufactured products not shown separately.

have lessened as higher consuming areas have experienced sharper declines than lower consuming markets.[1]

Growth in commercial use of cheese has been very important to the dairy industry over the past 20 years. Cheese production used more than a fourth of the market supply of milk in recent years, compared with less than an eighth in 1960. Per capita commercial use of American cheese grew about a fourth of a pound annually during 1970-81, while consumption of other varieties rose about a third of a pound per year. Half of the growth in sales of other varieties (about a third of the total growth) came from mozzarella. Virtually all of the expansion in cheese sales has been in natural forms; per capita sales of processed cheese items have been stagnant. Cheese comes in a great many forms and can be used in a myriad of ways. As consumers started to use more cheese, they began to learn more about cheese varieties and uses. This led to further expansion in use. However, such growth obviously is not unlimited; the period of most rapid percentage growth probably has already occurred.

The progressive replacement of butter by margarine has apparently ended. Since 1970, sales of butter and margarine have fluctuated but have shown no important trend. However, butter sales are still sensitive to the relative prices of the two products. More than half of the butter is used by away-from-home eating places and as an ingredient in dairy products or prestige versions of bakery, candy, or other products. The value of butter in nonhousehold uses derives in part from its ability to enhance quality image and advertising appeal.

Per capita sales of nonfat dry milk (excluding that used in other dairy products) declined by more than 0.1 pound (roughly 5 percent) annually during 1970-81. The largest declines were in direct household use, bakery use, and (since the mid-seventies) use in dry mixes. Whey products and vegetable proteins have replaced nonfat dry milk in many uses.

Use of nonfat dry milk in dairy products has also declined, largely because of less fortification of fluid milks. In 1970, almost 75 percent of the lowfat and skim milk sold in Federal order markets had added nonfat solids. This proportion had dropped to about 20 percent by 1981. Processors discovered in the midseventies that nonfortified products had good consumer acceptance.

Since 1970, per capita use of ice cream has shown no trend, sales per person of ice milk and sherbet have slipped slightly, while use of mellorine (frozen dessert made with vegetable oil) moved substantially lower. Sales of frozen products actually have fared well since they were subjected to adverse demographic shifts similar to fluid milk.

Consumption Response to Changes in Prices and Incomes

Dairy product sales respond relatively little to price changes, at least in the short run. A 10-percent decrease in retail prices will increase sales of fluid milk by only about 1.5 percent.[2] Butter and cheese sales would increase the

1/ For additional information about consumption patterns for fluid milk and other dairy products, see Blaylock and Smallwood.

2/ Estimates of demand response to price and income are drawn largely from Boehm and Babb, and George and King.

most (7 to 8 percent), with other products falling between. Total commercial use would be expected to rise about 3 percent if retail prices fell 10 percent. Since raw milk comprises about 50 percent of the value of dairy products at retail, a 20-percent drop in farm milk prices would be needed to reduce retail prices by 10 percent and increase sales by 3 percent.

This low level of shortrun demand response to price has several ramifications. First, small variations in milk output will result in substantial price movements as long as prices are determined by the market. This contributes to price volatility. Second, total consumer expenditures for dairy products vary directly and almost proportionately with price level. For example, a 10-percent increase in retail prices will increase consumer expenditures by about 7 percent. Third, the small consumer responses to price are difficult to observe because they can easily be veiled by demographic changes, changes in tastes, and other factors.

Consumers probably are somewhat more responsive to prices in the long run than the short run. However, attempts to measure longrun response have been plagued by problems of sorting out price response from the effects of trends and demographic changes. Since there appears to be little additional response after 12 to 18 months, an assumption that the longrun response is only slightly greater than the shortrun response seems reasonable.

Some dairy products are affected more by incomes and general economic conditions than others, although the impacts are relatively small in all cases. Fluid milk sales generally are not changed significantly by income changes. Butter consumption and cheese consumption are positively related to income, but the effect is small. Sales of both of these products in recent years have varied with the state of the economy.

Substitute Products

Substitute dairy products have had a significant impact on the demand for both butterfat and nonfat milk solids. Substitutes include filled products--those which have had their butterfat component replaced by vegetable fats--and imitation or analog products, which include no dairy ingredients at all. Of the imitation products, margarine is the most prominent. Per capita sales of margarine overtook butter sales in 1957, 7 years after the repeal of the Federal Margarine Act. Today, margarine maintains its 75-percent share of the table spread market acquired since the late seventies, mainly due to its lower price, convenience of use, and lower cholesterol content as compared with butter. Other filled dairy products which have appeared in the market and since declined in importance include filled evaporated milk, filled ice cream, filled milk, and filled cheese.

Imitation dairy products include powdered whipping creams, toppings, coffee whiteners, imitation milk, and imitation cheeses. All resemble dairy products when used, but they consist of vegetable fats and an assortment of vegetable and animal proteins, emulsifiers, stabilizers, sugars, buffering agents, flavorings, and coloring agents. Whipped toppings and creamers are prominent products in this product category. Both products have captured a large part of their respective markets due to lower ingredient costs and builtin consumer convenience over their traditional dairy counterparts. However, the total impact of these products on the demand for dairy products has been small.

Imitation cheese has the potential to expand in its market, particularly given its lower ingredient costs and apparent improvements made in the taste and texture of the product. Trade estimates give this product a 5- to 10-percent share of the U.S. cheese market currently.

Market Pricing Mechanisms

Prices for milk and dairy products are partly administered and partly negotiated in the marketplace. Market pricing is most readily observable at the wholesale level for dairy products and at the producer level for Grade B milk.

Wholesale Trading of Manufactured Products

Manufactured dairy products are traded in thin markets. Transactions are largely between individual buyers and sellers on a one-to-one basis. Relatively few traders do the bulk of the trading for each category of product. Many transactions are routinized through contracts or informal arrangements. Very small quantities are traded on open public markets.

Spot trading in butter is conducted in weekly sessions on the Chicago Mercantile Exchange, while cheese is traded on the National Cheese Exchange. The exchange prices serve as the basis for pricing formulas which include premiums or discounts for location, product characteristics, and services provided. Exchange prices are the source of most wholesale price changes, although some formula adjustment occurs (particularly in the long run).

Thin markets have some inherent problems. Information flows become internal to the firm instead of being expressed in open trading. Individual firm decisions can have a major impact on prices, either directly or through others imitating the actions of the price leader. This can distort market values where the firm's actions represent unique circumstances, rather than general conditions, or where a firm attempts to manipulate prices. Wholesale dairy markets have shown some thin market problems. When prices have not been determined primarily by support purchase prices, price changes have tended to be quite lumpy, with periods of substantial change separated by weeks of no change. There have been signs of price leadership at times, although leadership typically has been expressed in the timing of price changes rather than in magnitudes or direction. Manipulation of exchange prices has not appeared to be a problem.

Minnesota-Wisconsin Price

The Minnesota-Wisconsin (M-W) price is the weighted average price paid for nonorder milk for manufacturing in those two States. The M-W price reflects the level of wholesale product prices (which may be determined by support purchase prices) and a manufacturing margin determined in the marketplace. Under the Federal orders, the price of milk going into storable manufactured products throughout the country is basically set equal to the M-W price while the Class I price in each market area equals the M-W price plus a local differential.

Prices based on a competitively determined margin have some definite advantages. Rigidities and possible distortions associated with administratively set margins are avoided. Changes in input prices or differences in cost because of volumes processed are reflected more quickly. Manufacturers can use price to attract or

discourage movement to their plants. Unregulated margins tend to enhance efficiency in manufacturing since there is no assured level of return.

The ability of the M-W price to reflect accurately the competitive value of milk for manufacturing is an increasing source of concern. Conversion of Grade B producers to Grade A has eroded the base for determining the M-W; Grade B output in the two States fell from 15 billion pounds to 10 billion pounds between 1970 and 1981. The number of plants used to determine the M-W price also fell by 33 percent during this same period. With large, dispersed plants, individual firm decisions and localized circumstances can have a more pronounced effect on the reported price. The larger role taken by cooperatives in manufacturing dairy products has also affected the M-W price. Cooperatives have means other than the price paid for milk to adjust revenue flows to producers and can shift revenues between Grade A and Grade B producers. In recent years, plants have used hauling subsidies as a tool to compete for producers. This has introduced a distorting element, since these subsidies are not reflected in the quoted price.

In addition to the problems of accurately determining a competitive value for Grade B milk, the value of Grade B milk is less than the value of Grade A milk used for manufacturing if the Grade B volumes become too small. To accommodate small Grade B volumes, plants must either incur the costs of a dual-intake system or sacrifice economies of size.

Problems with the M-W price are still a considerable distance from being critical. The M-W price represents about 15 percent of the whole milk used in manufacturing. This milk is concentrated in an area with fairly active competition. However, the number of years that the M-W price can adequately perform its current role probably is limited.

Processing Subsector

The processing subsector which transforms farmers' milk into the products that consumers buy has undergone marked change in recent decades. Substantial efficiency gains and reductions in real costs have been achieved.

Structure

The dairy processing industry has been characterized by a trend in recent decades toward fewer but larger plants, diminished importance of proprietary dairy firms, and regional shifts precipitated by shifts in population and shifts in milk production in excess of fluid sales. The number of plants producing cottage cheese and butter dropped by roughly 90 percent from 1950 to 1980. Hard cheese and ice cream plant numbers declined by approximately two-thirds and nonfat dry milk plant numbers by 75 percent (table 7). In 1980, average output per plant was 10 times the 1950 level for butter and cheese, 5 times greater for nonfat dry milk, 15 times larger for cottage cheese, and 25 times more for ice cream. Automation and technological advances, such as continuous churns, have increased economies of size in processing. However, changes in assembly and distribution costs probably have been at least as important. Dairy farm size has increased rapidly and many have switched from cans to bulk tanks. Fluid milk outlets have shifted from home delivery and small grocery stores to large supermarkets. Improved roads and trucks have reduced real costs of shipment. Consolidation of cooperatives and plants has allowed overlapping routes to be eliminated. Improved refrigeration (from the farm through the home) has improved milk quality, making long distance

Table 7--Number of dairy product manufacturing plants, selected years

Product	Manufacturing plants in--			
	1950	1970	1980	1982
	Number			
Hard cheese	2,158	963	737	697
Butter	3,060	622	258	231
Nonfat dry milk (human food)	459	219	113	108
Hard ice cream	3,269	1,628	949	884
Cottage cheese curd	1,900	593	269	248

Source: USDA, Dairy Products, Annual Summary, selected years.

shipment much more feasible. All of these factors have reduced the relative importance of assembly and distribution costs, which in turn has spurred the trend towards larger plants.

Dairy cooperatives have integrated forward into manufacturing. Between 1957 and 1973, cooperatives' share of total production increased from 18 to 35 percent for natural cheese and from 57 to 85 percent for dry products, while holding at about 60 percent for butter. Important factors underlying this shift include the transfer of the fluid balancing function to cooperatives, a perceived need for cooperatives to assure members of an outlet for all of their milk, a desire to control more of the value added to milk, and the tendency of large traditional dairy corporations to specialize in dairy merchandizing and to diversify into other products. Cooperative integration into fluid and soft manufactured products has been considerably more modest. The cooperative share of fluid milk processing rose from 10 to 15 percent between 1964 and 1980.

Backward integration by food chains into fluid processing increased from 3 percent of sales in 1964 to almost 18 percent in 1980. Their share of relatively modern capacity is considerably higher. Since chains provide assured outlets for their integrated plants, a major risk associated with constructing new processing capacity is eliminated. In addition, deliveries from integrated plants can be more easily tailored to fit an overall chain distribution system. Chains were able to circumvent outmoded labor practices in some cases.

Production of perishable manufactured products is generally located close to consumption. Frozen products and cottage cheese are typically produced as part of an operation which also processes fluid milk, although some degree of specialization is common. Soft product manufacturing serves as a balancing mechanism for some fluid operations. Regional patterns of soft product output are highly correlated with population and fluid milk sales.

The most important regional change in butter and cheese manufacturing has been the decline in importance of the Corn Belt and Plains. Their share of the U.S. total fell from 40 to 18 percent between 1950 and 1980. The traditional dairy areas of the Northeast and Lake States gained in relative importance, as milk production declined in the heavy grain producing areas. The South also gained, although its share of total volume remained relatively small. The sharpest gains occurred in the Pacific States, particularly California which exhibited growing milk production in excess of fluid needs. Growth in manufacturing capacity in the Southwest has been concentrated in butter-powder; the region's share of butter production in 1980 was more than three times its share of cheese output. This contrasts sharply with the Midwest, which formerly specialized in butter, but where shrinking demand for butter and nonfat dry milk and growing demand for cheese have caused a shift towards cheese capacity. This shift has not been borne equally. Plants involved in balancing the fluid market have remained predominantly in butter-powder while full-time manufacturers have converted to cheese. Cheese seems to be poorly adapted to variable levels of output, giving balancing plants a comparative advantage in butter-powder production.

Marketing Costs

Marketing cost has risen less rapidly for dairy products than for other foods since 1970. Retail dairy prices have fallen relative to prices of all foods of domestic farm origin, even though the relative farm price was higher in recent years than in 1970. This occurred without dramatic technological advances in dairy manufacturing and distribution. Poultry is the only major food category to post a larger decline in real marketing costs.

Several factors have contributed to the decline in real marketing costs. Large regional cooperatives have gained efficiencies through central coordination of supplies for fluid markets, eliminating overlapping assembly routes, and economies of size in manufacturing. Larger farms have contributed to lower assembly costs. The dairy industry may have adjusted to rapid rises in energy costs better than other food industries because it already had great expertise in handling energy costs, a major factor in dairy marketing costs.

Technological advances have been gradual and subtle, but also substantial and pervasive. Whenever old plants or equipment have been taken out of production, their replacements have been more efficient. Important improvements have included automation in cheese production, automated case filling, stacking, and handling in fluid processing, more complete availability of clean-in-place equipment, and improved drying systems.

Role of Producer Cooperatives

More than 75 percent of the Nation's milk and an even higher proportion of fluid grade milk is sold through cooperatives. Over 85 percent of the producers in Federal order markets are members of cooperatives.

Cooperatives have assumed a high degree of responsibility for providing processors with milk as it is needed. They procure, assemble, and coordinate a fluctuating supply with a variable demand. They also provide farm quality control, intermarket transfer, and surplus management. Performing these functions has also resulted in cooperatives becoming more involved in handling reserve supplies for fluid markets which are processed into manufactured dairy products. This central

coordination has given rise to much of the increased productivity realized in milk processing and manufacturing.

Immediately following the formation of the regional cooperatives in the late sixties, these cooperatives undertook a consolidation of manufacturing facilities, especially cheese plants, to improve operational efficiency. This activity was especially significant in the West North Central region, where many small plants were closed and replaced by a few large, efficient plants. Thus, regional cooperatives have a relatively large portion of the larger manufacturing plants.

In addition to consolidating manufacturing plants, the regional cooperatives increased cheese production capacity. In response to marked increases in cheese consumption, cooperatives converted several butterpowder plants to cheese plants and increased the capacity of several existing cheese plants.

Variability and Orderliness in Fluid Milk Markets

Federal regulation of fluid milk markets arose in the thirties when the Depression aggravated already chronic marketing problems. Variability of supply and demand was the root of the problem. Since milk is both highly perishable and bulky, the usual mechanisms for handling such variability--storage and transportation--were not very effective. Variability had to be handled by maintaining reserves of raw milk. Costs arising in providing these reserves are inherently difficult to quantify and development of pricing schedules which accurately reflect such costs is even more problematic. Consequently, individual plants tried to avoid their share of the costs, leading to inequities among plants and among producers and to inherently unstable or "disorderly" markets. Half a century of technological and structural change has altered, but not removed, the conditions which led to earlier market failures.

Substantial costs were incurred in the thirties in meeting the higher sanitary standards required to sell milk for fluid use. A sizable incentive was needed to insure that enough Grade A milk was produced to provide an adequate reserve. The difference in production cost between grades is now almost insignificant. The gap between standards has narrowed and much of the technology needed to meet Grade A standards is in use on all farms because of cost savings. Fixed costs of such things as structural alterations or relocation of wells are far less important on a farm producing 800,000 pounds per year than for one producing 40,000 pounds, particularly when facilities are replaced.

Markets in the thirties were essentially local, comprised of a single urban area and nearby production. Raw, or even packaged, milk movements between markets were expensive and risky. This created a need to maintain adequate local supplies. Vastly improved quality throughout the system and relatively cheaper transportation have virtually eliminated truly local markets. For example, the Indianapolis market relies to a significant extent on milk produced in Wisconsin. Aggregation of small, local markets into larger markets tends to diminish total variability, since periods of tightest supplies and greatest surplus in one market may not coincide with those in another.

Although long distance shipment of milk no longer presents substantial technical problems, reserves can be effective only if milk can reach its destination in time to meet the need. There is no problem where variation can be anticipated, but a reserve of milk sufficient to cover unforeseen variation must be present

in the market. Long distance shipment of milk shortens its storage life and diminishes its value for reserves. Therefore, milk produced within a region retains a slight advantage over imported milk.

Variability in production was very pronounced during the thirties. In 1934-35, U.S. daily average production in June was 55 percent larger than the December low. By 1980-81, the May peak was only 13 percent higher than the November trough. In addition, month-to-month variability other than the seasonal pattern has diminished. Seasonal variability in milk production reflects changes in availability and quality of forage and to a lesser extent the effects of temperature and humidity on cows. Variability has been reduced by heavier feeding of concentrates, more even distribution of calving dates, and other improvements in managing the milking herd and forage production.

Unlike production, seasonality of fluid sales is increasing. At one time, fluid consumption was relatively constant. Now, fluid sales have seasonal extremes roughly as wide as production. Fluid use is low during the hot summer months and peaks during early winter in most markets. Thus, seasonality of demand compounds the effects of seasonality of supply. The pattern of the seasonal surplus is very similar to that of two decades ago, as increased seasonality of demand has offset diminished seasonality of supply.

Consumers probably drink about the same amount each day of the week, but their purchases vary widely. During the thirties, daily home delivery and limited storage in the home produced a relatively constant daily and weekly flow of milk through the system. The shift to supermarket sales has tied sales by processors to consumer shopping patterns rather than to final use. Processors consequently sell about 45 percent more milk on Friday than at midweek, and insignificant amounts on Sunday. Holiday periods cause sharp alterations of shopping habits. Buying patterns are subject to considerable unanticipated variation.

Problems associated with output and consumption variability in the fluid market probably have not changed much, at least in recent decades. The benefits of flatter seasonal production have been offset by increased seasonality of consumption and sharply greater daily and weekly fluctuations. Important costs of balancing variability can include extra storage, transportation, and management needed to direct milk flows. However, the dominant balancing cost continues to be increased manufacturing costs for plants handling the fluid reserve. Variability in the quantities of milk to be manufactured results in considerably less efficient use of capacity in a balancing plant. Variability and balancing costs are generally reduced if a market is served by a single supply coordinator. This provides greater opportunity to offset high demand from some plants with low demand from others, as well as efficiencies in milk movement and balancing plant size.

Most processing plants performed the bulk of their own balancing during the fifties. Each plant had its own procurement network and manufactured its own surplus. Economies of central coordination have more recently led to concentration of the balancing function, mainly in the hands of cooperatives. The limited antitrust exemption of Capper-Volstead made it easier for cooperatives to provide central coordination than for a proprietary firm or a joint venture of processors. Since cooperatives do not have to pay producer-members Federal order minimum prices each month, they enjoy more shortrun financial flexibility than proprietary firms. Lastly, processors who provide any balancing services (other than those

which generate internal firm savings) have a competitive disadvantage compared with other processors as long as adequate supplies of milk can be obtained at uniform prices. Balancing mechanisms such as rolling inventories of raw and packaged milk and variable output of perishable manufactured products probably are underutilized because of uniform prices to all processors.

Costs arising from variability would pose no more threat to orderly marketing than any other cost if balancing services for an individual plant could be accurately identified and priced. Before regulation, fluid processors found it relatively easy to transfer some of their share of the cost to individual producers, manufacturing plants, or other fluid plants. Competition for such favored positions led to general market instability; the extreme examples were recurrent milk strikes between the 1890's and the 1930's. Federal order price regulation limited the potential advantage of such processor behavior and lent more stability to the market. As the balancing function has been shifted to cooperatives, the problem has changed appearance. Small groups of independent producers now can gain the greatest advantage from circumventing balancing costs, although processors can also benefit where over-order payments are in effect. Although the symptoms of the problem have changed, the ability to avoid full balancing cost remains a major threat to market stability.

Fluid processors had considerably more market power in earlier years than the relatively unorganized producers. Milk's perishability and bulk made even a small advantage a fairly powerful weapon. The emergence of large cooperatives which provide central supply coordination, some on a regional basis, has shifted the balance of market power. These cooperatives have the edge in market power in some markets, while processors or integrated supermarket chains have the advantage in others. There is generally less potential for fluid processors to exploit market power but more potential for cooperatives.

International Trade in Dairy Products

Dairy trade is small relative to the total world production of milk. Between 3 to 6 percent of world milk production is processed and traded between countries. Many countries' dairy policies have led to highly regulated dairy industries producing chronic surpluses. These countries, and most others, have set up import barriers which contribute to a misallocation of resources by restricting the flow of dairy products.

Roughly one third of the world's milk is consumed as fresh whole milk. Another one third of production is processed into butter. A large part of the remaining one third is processed into cheese, with the rest used in feed or other food products. Only about 10-15 percent of the world's butter production, 4-6 percent of its cheese production, 20-25 percent of its nonfat dry milk production, and up to 50-65 percent of its casein is traded on international markets (excluding trade within the European Economic Community). Thus, the importance of international trade varies with the product and the amount produced of that particular product in the exporting or importing country. For example, other countries are the sole source of supply for casein and some speciality cheeses for the United States, which in turn, is the major importer of these products.

Directly affecting the production, consumption, and trade patterns of milk and dairy products are the farm and trade policies of major dairy exporting and importing countries. Four groups of countries stand out in analyzing these

patterns: countries with highly regulated dairy industries, countries with little direct government involvement, centrally planned countries, and major importing countries.

The first group, producing about 50 percent of the world's production, includes the European Economic Community (EC), other countries of Western Europe, the United States, and Canada. Budget outlays in many of these countries for dairy programs have run from 20-50 percent of their total agricultural programs. About 66 percent of the world's dairy exports originate from countries with highly regulated dairy industries. The EC is by far the largest exporter with their butter and nonfat dry milk going to the USSR and developing countries; cheese exports going to the United States, Japan, and developing countries; and casein exports to the United States. These commercially traded exports are heavily subsidized through the EC export "restitution" program. Subsidized commercial exports or food donations also come from the other Western European countries, Australia, Canada, and the United States.

Another one-third of the world's dairy exports originates in countries with little direct government intervention, mainly Australia and New Zealand. With only about 5 percent of the world's milk production, these countries account for one-sixth of the world's trade in nonfat dry milk, one-quarter of the world butter and cheese trade, and about two-thirds of the world's casein trade (excluding intra EC trade). Dairy production and trade are important to these countries' economies. Major markets for their products are Japan (all products, but mainly cheese), the United States (mainly casein), and developing countries.

Most major dairy producing countries tightly control their imports. The EC effectively is closed to imports of dairy products except for a special butter quota granted to New Zealand. The centrally planned countries of Eastern Europe, producing about one-third of the world's milk and basically using it within their borders, are sizable importers, but on an erratic basis. The United States and Canada import significant (but controlled) amounts of specialty cheeses. The Middle East OPEC countries and less developed countries have relatively free access for imports. The combined milk production of all major importing countries makes up 10-13 percent of the world's milk production.

The international market for dairy products bears almost no relationship to a freely operating market. Inexpensively produced products from New Zealand and Australia must compete with heavily subsidized products for access to limited world markets. The dominant factor in world dairy trade is the reliance on export subsidies and import barriers by many countries in order to pursue domestic goals. These policies hinder resource adjustment, restrict the flow of dairy products, and produce a delicate balance in the international dairy marketplace. Even a small amount of food aid donations have a significant impact on this sensitive market. In total, the entire international market is equivalent to less than one-half of the U.S. domestic market.

ECONOMIC EFFECTS OF CURRENT PROGRAMS

Current dairy programs affect farmers, milk processors, dairy product consumers, and taxpayers in many different ways. As an aid in evaluating these effects, this section begins with a review of performance criteria for dairy programs.

The specific features of each program are then described and their effects are evaluated. Dairy price supports are treated first, followed by Federal marketing orders (including Federal cooperative policy), and other dairy programs.

Criteria for Evaluating Programs

Federal dairy policy, like all forms of Government intervention in the marketplace involves tradeoffs among various program impacts. The strengths and weaknesses of any particular program depend in part upon whose interest is of concern. Thus, elevating milk prices above market-clearing levels might be viewed as a program strength by farmers, but as a weakness by milk consumers and taxpayers bearing the costs of managing surpluses and associated resource misallocation. No single set of program goals is likely to be acceptable to all interested persons. Criteria must be established in order to evaluate the tradeoffs involved.

Economic efficiency is an important criterion for evaluating regulatory programs. Economic efficiency in the broadest sense involves maximizing aggregate social benefits or welfare--the absolute size of the "economic pie"--given the resources available and without regard to the distribution of benefits among individuals. More goods and services are generally preferred to less, making economic efficiency a goal in itself. Aggregate social welfare is easier to measure in theory than in practice. Many welfare effects of dairy policy cannot be measured very accurately and some are offsetting to an unknown extent. Because of these measurement problems, dollar estimates of aggregate welfare effects are not provided in this analysis.1/

Because aggregate welfare is so difficult to measure, economic efficiency must often be gauged by looking at one part of the system at a time. Thus, a production process might be considered inefficient if a less costly alternative process were available to accomplish the same result. An example would be two trucks following the same route to pick up partial loads of milk from neighboring farmers. Inefficiencies can also occur in the marketplace. If the price for two products differs by more than the cost of transforming one into the other, an inefficiency is indicated. This criterion provides a basis for evaluating price relationships in the dairy industry. Such criteria must be applied with care, however, since the price for milk covers not only the product itself, but also a set of associated services.

A serious problem in appraising the effects of Federal dairy policy on efficiency is specifying a basis for comparison. In dairy markets, few would argue that textbook-variety perfect competition would prevail in the absence of a price support program and marketing orders, for example. Thus, comparing actual performance against a perfectly competitive norm would be misleading. Stability is a frequently mentioned goal of dairy programs. A degree of stability may be viewed as an end in itself or as contributor to the broader end of efficiency. Variability arises from many sources: fluctuations in prices of feed and other inputs; erratic or unfair competitive practices; sudden changes in Government programs; shifts in demand; introduction of new technology; and natural seasonality in costs and output. Some of these changes are desirable and some undesirable. Erratic fluctuations in prices and quantities are generally undesirable because

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1/ A partial comparison of the welfare effects for selected programs is furnished in Appendix A.

they subject producers, processors, and consumers to uncertainty and prevent full use of fixed resources. Production cycles which result from errors in producers' expectations and decisions are also wasteful. In contrast, regular cyclical movements associated with the seasons or day of the week and which reflect underlying cycles in costs or consumers' wants are not necessarily objectionable. Moveover, changes associated with the adoption of new and more efficient technology are generally to be encouraged. Thus, the goal to be sought is not stability, per se, but rather the mixture of stability and progressiveness that maximizes economic product for producers and consumers over time.

Economic efficiency is seldom a specified goal of Government market intervention. Policy goals specified may, in fact, be incompatible with efficiency. Hence, another important criterion for evaluating programs is how well they have achieved their stated objectives. For example, a stated goal of existing dairy price supports is an adequate supply of pure and wholesome milk at a reasonable price. A stated goal of milk marketing orders is orderly marketing. These goals defy precise interpretation. Operational measures include reasonable stability of prices and output, absence of unfair competitive practices, and absence of health problems attributable to milk.

Whereas economic efficiency relates to the size of the economic pie, income distribution relates to how the pie is sliced, including the transfers resulting from Government intervention. These transfers (of property rights, market power, income, etc.) may result in a net loss in economic efficiency, but still be deemed desirable by society. Income distribution effects need to be identified and, where possible, measured. But there is no objective economic basis for judging their desirability from the standpoint of society as a whole.

Federal dairy programs have many more specific effects which call for evaluation. These include effects on the number, size, and regional distribution of dairy farms and milk processing plants and firms, effects on the United States's position in international trade, and effects on the independence or decisionmaking freedom of farmers and other businesses. Objective norms for evaluating these effects are generally lacking since opinions vary greatly about how to measure the effects and the levels desired.

Price Supports

The support price undergirds the entire price structure for milk sold by farmers to processors. Prices are supported through CCC offers to buy butter, nonfat dry milk, and cheese at prices designed to return the support price to manufacturing grade producers, on average. The Government's willingness to buy products in effect sets a floor under the price of all milk.

Evolution of the Price Support Program

Price supports were started during World War II under wartime legislation and extended through 1949 by the Agricultural Act of 1948. The Agricultural Act of 1949 established the permanent program which is still part of the law. It directed the Secretary to set a support price within the range of 75 to 90 percent of parity which would bring forth an adequate supply of milk to meet the needs of American consumers. The objective was broadened in 1973 to include the preservation of sufficient productive capacity to meet anticipated needs.

The minimum support price for milk has been temporarily raised from the 75-percent level in the basic legislation to 80 percent by Congress four times--in September 1960, August 1973, September 1977, and November 1979 (table 8). Legislation in 1957, 1975, and 1976 raising the minimum level was passed and vetoed.

The Agricultural and Food Act of 1981, passed at a time of large surpluses, used a set of triggers relating the minimum support level to the size of CCC purchases. As long as large removals continued, the support prices were specified in dollar terms with the 1981-82 price at the 1980-81 level of $13.10 per hundredweight, which was 72.9 percent of parity in September 1981, and modest increases thereafter. Only if surpluses declined to stated levels would supports at 70 or 75 percent of parity be required. With continued surpluses, 1982 legislation froze prices for 2 years and provided for fees on milk producers' marketings to partially offset Government costs. Part of the fee was tied to a supply control plan. The 1983 Dairy and Tobacco Adjustment Act lowered the price support level to $12.60 and allowed further reductions in supports in April and July 1985 if projected government purchases exceed specified amounts. A $0.50 per hundredweight deduction on marketings was mandated to help pay producers for reducing marketings below base levels.

Before 1977, support prices were set annually at the beginning of the marketing year and were effective throughout the marketing year, unless the Secretary chose to raise them. The Food and Agriculture Act of 1977 required a second annual adjustment in the support price to reflect changes in the parity index during the first 6 months of each marketing year. This had the effect of raising the support price in the middle of the marketing year to reflect increases in the index of prices paid by farmers. The last such increase, which would have been effective April 1, 1981, was eliminated by congressional action at the Administration's request.

Between 1953 and 1973, supports were set by the Secretary of Agriculture at the legal minimum in 7 years, above the minimum in 13 years, and in the 1960-61 marketing year at the minimum level part of the year and above it for the rest of the year. This was a period of secular decline in demand for dairy products and fairly stable feed prices as a result of the feed grain price support program and excess capacity in feed grain production.

During this period, when supports were between 75 and 79 percent of parity (2-year average), CCC removals averaged 4.2 percent of marketings. In the 12 years when supports were at 80 percent of parity or higher (2-year average), removals averaged 5.8 percent. While there were many differences between subperiods, it appears that the longer run supply-demand equilibrium level of milk prices was in the range of 70-79 percent of parity from 1953 to 1978, but substantially lower since then due to lower feed costs, reduced opportunities outside of dairying, and continued gains in productivity.

The relatively stable feed prices provided by the price support program for grains ended with the entrance of the Soviet Union into the international grain market in 1972. Since that time, supply-demand relationships in the dairy industry have been considerably different. Announced supports were at 79 percent of parity or above from August 1973 until 1980 and CCC removals were below 5 percent of marketings except in 1977 and 1980. Changes on both the supply and demand side contributed to this situation. The long-time decline in per capita commercial demand for dairy products leveled off during this period.

Table 8--Manufacturing milk: Comparisons of announced support prices and U.S. average market prices paid to producers

Marketing year beginning in-- 1/	Date effective 2/	Support level: As a percentage of parity equivalent: Minimum	Support level: As a percentage of parity equivalent: Announced 3/	Support level: Price per 100 pounds	Average market level: Price per 100 pounds	Average market level: As a percentage of parity equivalent: In month prior to marketing year	Average market level: As a percentage of parity equivalent: Average during marketing year
	Date	--Percent--		--Dollars--		--Percent--	
1949	1/01/49	90	90	3.14	3.14	90	89
1950 4/	1/01/50	75	81	3.07	3.35	88	85
1951		75	86	3.60	3.97	94	93
1952		75	90	3.85	4.00	93	95
1953		75	89	3.74	3.46	83	84
1954		75	75	3.15	3.15	75	80
1955		75	80	3.15	3.19	81	82
1956		75	82	3.15			
	4/18/56	75	84	3.25	3.31	86	84
1957		75	82	3.25	3.28	83	82
1958		75	75	3.06	3.16	77	77
1959		75	77	3.06	3.22	81	81
1960		75	76	3.06			
	9/17/60	80	80	3.22			
	3/10/61	80	85	3.40	3.31	83	82
1961		80	83	3.40	3.38	83	82
1962 5/		75	75	3.11	3.19	76	76
1963		75	75	3.14	3.24	77	77
1964		75	75	3.15	3.30	77	78
1965		75	75	3.24	3.45	80	79
1966		75	78	3.50			
	6/30/66	75	90	4.00	4.11	92	90
1967		75	87	4.00	4.07	88	87
1968		75	89	4.28	4.30	90	87
1969		75	83	4.28	4.55	88	86
1970		75	85	4.66	4.76	87	85
1971		75	85	4.93	4.91	85	82
1972		75	79	4.93	5.22	84	80
1973	3/15/73	75	75	5.29			
	8/10/73	80	80	5.61	6.95	99	91
1974		80	81	6.57			
	1/04/75	80	89	7.24	6.87	85	78
1975		75	79	7.24			
	10/02/75	75	84	7.71	8.12	89	84
1976		75	80	8.13			
	10/01/76	75	81	8.26	8.52	84	82
1977 6/	4/01/77	75	82	9.00	7/ 8.77	80	80
1977		86	86	9.00			
	4/01/78	9/ 80	8/ 80	9.43	9.30	85	79
1978		80	80	9.87			
	4/01/79	9/ 87	8/ 87	10.76	10.86	88	80
1979		80	80	11.49			
	11/28/79	80	80	11.49			
	4/01/80	9/ 87	8/ 87	12.36	11.75	82	76
1980		80	80	13.10	12.71	78	73
1981		75	75	13.49			
	10/21/81	73	73	13.10	12.66	70	68
1982	10/01/82	69	69	13.10	12.66	67	64
1983	12/01/83	62	62	12.60			

1/ Start of marketing year April 1, from 1951 to 1976, and October 1, from 1977 to present.

2/ If other than start of year.

3/ The actual percentage of the parity equivalent price published in the month before the marketing year. In some cases the announced percentages, based on forward estimates of parity, were slightly different.

4/ January 1, 1950 - March 31, 1951.

5/ Beginning November 1962, parity equivalent is based on prices for all manufacturing grade milk instead of the "3-product" price for American cheese, evaporated milk, and the butter-nonfat dry milk combination used before.

6/ April-September transition period.

7/ Adjusted to annual average fat test.

8/ Semiannual adjustment required by 1977 Act; announced support level as percentage of parity in March.

9/ Mandated semiannual adjustment to reflect changes in the prices paid index.

From the end of the Korean war through the sixties, percentage removals of nonfat solids were consistently greater than those of milkfat (fig. 2). The 1970 repeal of the requirement for support of butterfat in farm-separated cream provided greater flexibility in adjusting relative prices of milkfat and solids-not-fat. Relative prices of the components were adjusted from time to time in the seventies and removals of milkfat were higher than those of nonfat solids at some times and lower at others.

The products purchased--butter, nonfat dry milk, and American cheese--are widely produced and take two-thirds of the milk used in manufactured dairy products. CCC stands ready to buy these products in bulk--butter in 60- to 68-pound containers, nonfat dry milk in 50-pound bags, and cheese in 40-pound blocks and at times 500-pound barrels--at prices designed to result in a U.S. average price for manufacturing milk equal to the support price. The objective is to support only the average price of manufacturing grade milk, not the price to each producer. The prices received by individual producers depend upon many factors other than the support level, including plant location, product manufactured, quantity of milk delivered, local competitive situation, and plant operating efficiency.

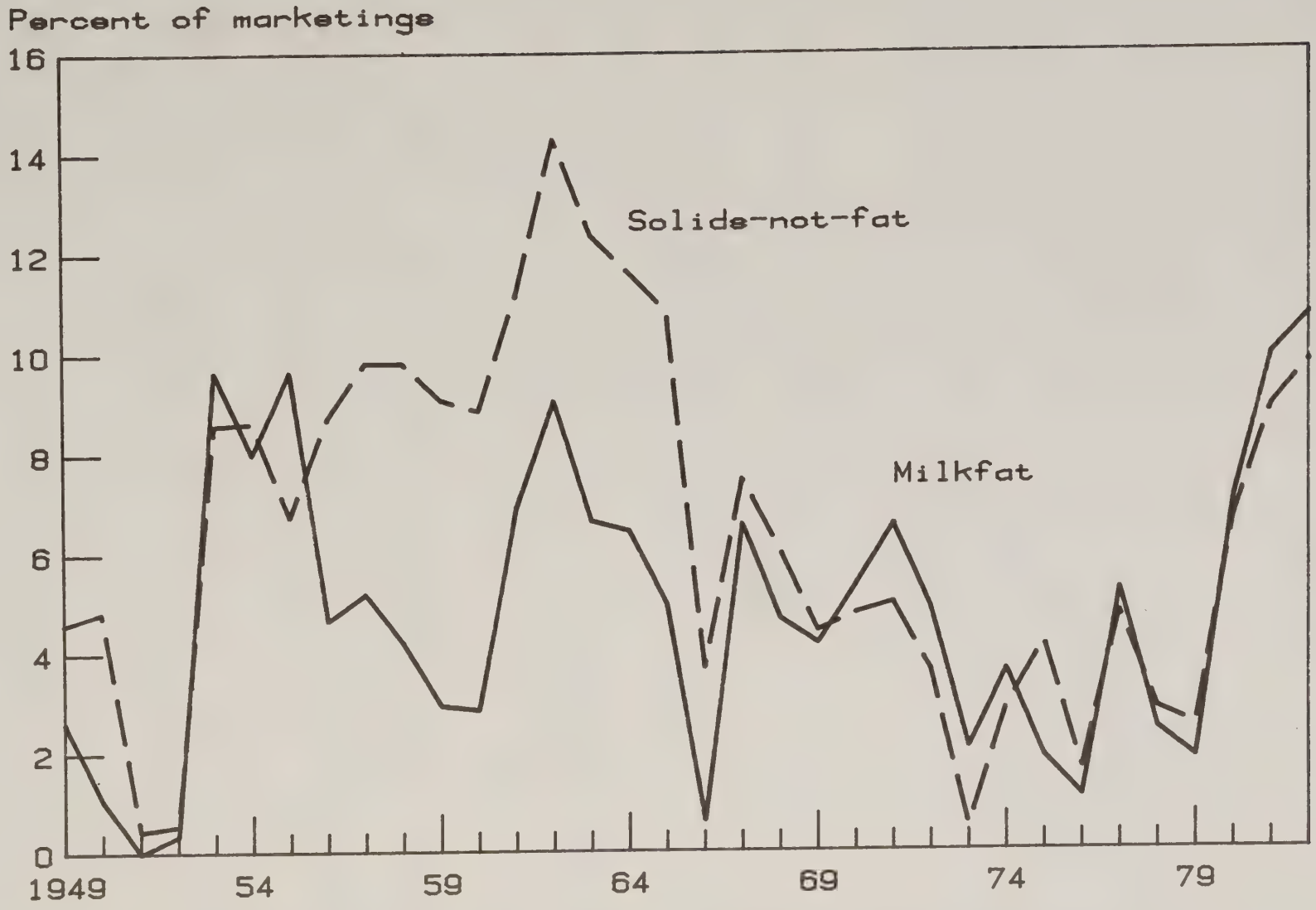
To attain the desired level of prices for manufacturing milk at the farm, CCC purchase prices for butter, nonfat dry milk, and cheese include "make allowances" or margins to cover the costs of processing milk into these products. These manufacturing margins are adjusted from time to time to reflect changes in manufacturing costs, although there is no established schedule or procedure. Prices to farmers for manufacturing grade milk are free to move above the support level if supply and demand conditions warrant. They have moved above the support level in the short-supply season of most years and, at times, even during the flush season (fig. 3). However, manufacturing milk prices have been below the support level since March 1980.

In order for such a purchase program to avoid accumulating CCC stocks, adequate outlets must be available for the products acquired. In the fifties and sixties, domestic donations of food and somewhat similar foreign donation programs provided outlets for most of the products acquired. With food stamps replacing food distribution in the seventies, school lunch became the only remaining sizable domestic outlet until 1981 when direct distribution was resumed on a limited scale. Donations for foreign feeding programs became severely limited by budget restrictions on foreign aid, although CCC can donate abroad using its own funds. Subsidized export was a major outlet for butter and nonfat dry milk in the mid-fifties and sixties but this program no longer exists and more recent trade policy has made the use of export subsidies much less likely.

Much of the time, the relative commercial value of butterfat and solids-not-fat is effectively determined by the support purchase prices for butter and powder. Until 1970, legislation required supporting both milk for manufacturing use and butterfat in farm-separated cream between 75 and 90 percent of parity. This left limited discretion in determining relative values of butterfat and solids-not-fat.

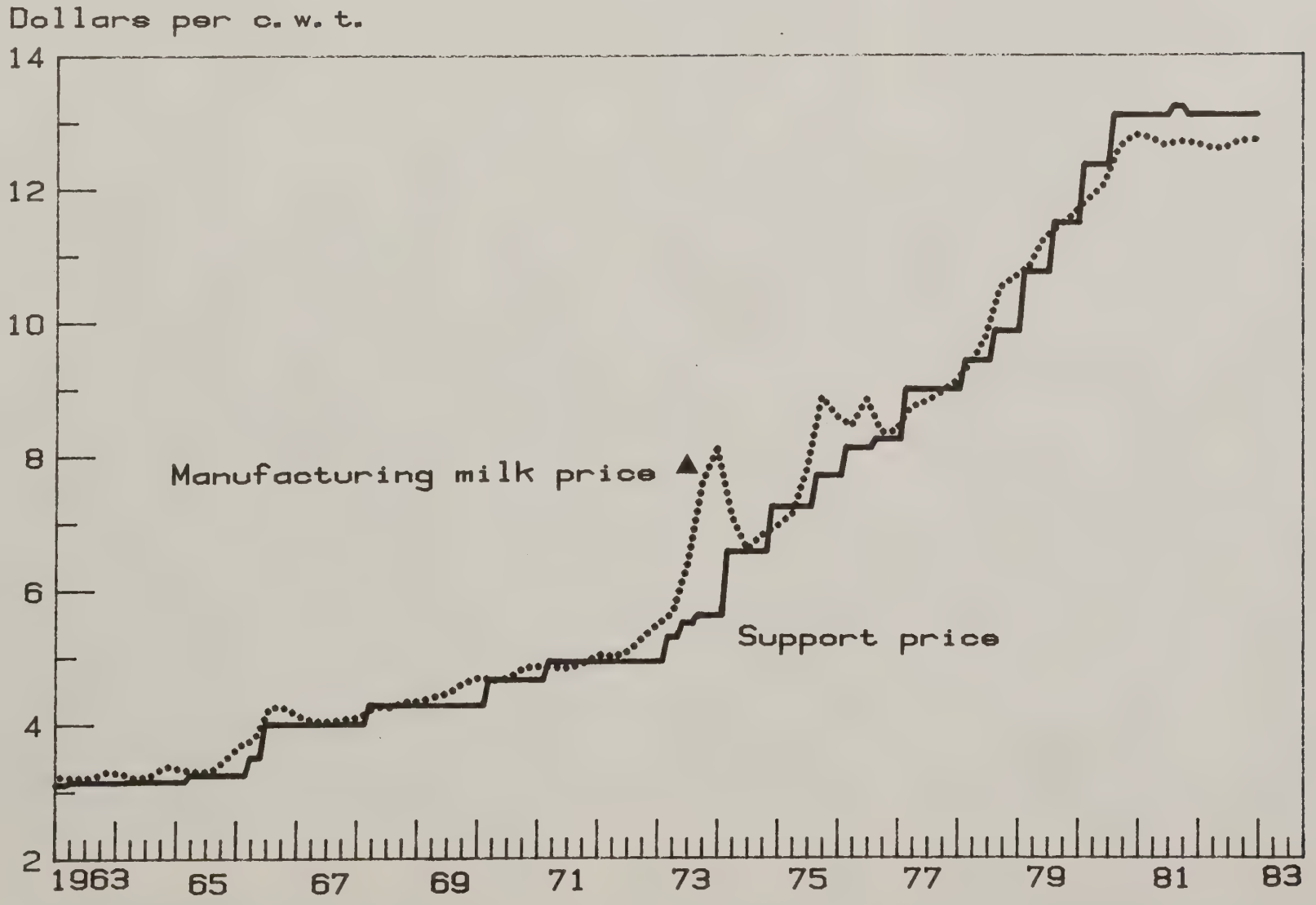
Relative prices of butter and nonfat dry milk have changed markedly, partly as a result of price support actions. The price per pound of butter was 4.3 times that of nonfat dry milk in 1960. The ratio stayed about 4 to 1 through 1965 and declined to near equality in 1974. The ratio has been about 1.6 to 1 since 1980.

Figure 2
Milk Solids Removed from the Market by CCC Programs *



* Deliveries after domestic unrestricted sales.

Figure 3
Price Support and Manufacturing Milk Prices*



* Quarterly ▲ Adjusted to annual average fat test.

Nominal costs for price supports ranged from $69 million to $612 million between 1952-53 and 1972-73, averaging $325 million (table 9). Since then with much more variable conditions, they have been down and up. In 1982-83, costs were $2,600 million.

Import Regulation

While U.S. dairy product prices are roughly the same as the domestic prices in most major dairy countries, they are 2 to 3 times current prices in the small international market. Without controls imports would greatly increase the cost of supporting prices for U.S. producers. Import quotas are authorized under Section 22 of the Agricultural Adjustment Act of 1933. Under Section 22, quotas may be imposed, adjusted, or eliminated only by the President, based ordinarily on the findings and recommendations of the International Trade Commission (ITC). A permanent increase in a quota, for example, could come only if the President were convinced, as indicated by the ITC investigation, that such an increase would not materially interfere with the price support program for milk.

U.S. dairy import policy is shaped by these considerations:

Dairy import policy is one part of U.S. trade policy and is often seen as conflicting with its general freer trade thrust.

Every major developed dairy country in the world has government programs regulating its dairy industry; most subsidize part or all of domestic production. Exports are subsidized by many countries. Imports are restricted by practically all major dairy countries.

New Zealand and possibly Australia appear to have a comparative advantage over the United States in milk production, due to abundant year-round forage. But, their capacity to expand production is limited. The United States appears to have a comparative advantage over most of the major dairy countries in Europe.

The United States is committed, under the General Agreement on Tariffs and Trade (GATT), to freer world trade. Whereas the United States was allowed to continue dairy import restrictions that were in effect before GATT was negotiated and necessary for the operation of the price support program, any future strengthening of dairy import restrictions may be regarded by our trading partners as a violation of the agreement.

Without import regulation, varying supplies in foreign exporting countries would lead to instability in imports into the United States. Supplies of dairy products available for export from Europe, New Zealand, and Australia vary because of weather and economic conditions in those countries.

Under these quotas, imports of dairy products have been held to modest levels in most recent years. In 1960, imports were 0.5 percent of U.S. production, rising to 0.75 percent in 1965. There was a sharp jump in 1966 and 1967, with greatly increased imports of butterfat mixtures. The definition which permitted importing butterfat-sugar mixtures as "ice cream," a nonquota product, was changed and

Table 9--Net Government expenditures on dairy support and related programs, fiscal years, 1950-83

Fiscal year 1/	Net support purchases 2/	Military milk 3/	School lunch and welfare 4/	Export assistance 5/	Total (excluding special milk)	Special milk program 6/
			Million dollars			
1949-50	170.5	--	17.6	--	188.1	--
1950-51	7/-49.1	--	-.9	--	7/-50.1	--
1951-52	1.6	--	7.5	--	9.1	--
1952-53	274.9	--	25.1	--	300.1	--
1953-54	400.4	--	74.0	--	474.4	--
1954-55	228.7	4.3	24.4	--	257.4	22.2
1955-56	237.9	7.3	39.0	--	284.2	48.2
1956-57	239.1	16.4	75.6	--	331.1	61.0
1957-58	205.9	30.4	123.7	--	360.0	66.7
1958-59	102.1	23.0	106.2	--	231.2	74.7
1959-60	159.5	23.6	35.1	--	218.2	81.2
1960-61	173.9	25.3	82.1	--	281.3	87.0
1961-62	539.0	25.9	47.1	--	612.0	91.7
1962-63	454.0	24.8	--	6.7	485.5	93.7
1963-64	311.7	26.5	4.4	36.5	379.1	97.1
1964-65	157.2	26.2	105.6	44.7	333.7	86.5
1965-66	26.1	--	38.7	3.8	68.6	97.0
1966-67	283.9	--	15.1	18.4	317.4	96.1
1967-68	357.1	--	--	7.1	364.2	103.1
1968-69	268.8	--	45.4	13.1	327.3	101.9
1969-70	168.6	--	114.9	7.4	290.9	102.9
1970-71	315.4		94.8	11.6	412.8	91.8
1971-72	267.0	--	63.9	7.3	338.2	93.6
1972-73	135.8	--	15.5	1.5	152.8	90.8
1973-74	31.4	--	39.5	--	70.9	50.2
1974-75	485.8	--	10.3	--	496.1	122.9
1975-76	69.6	--	6.9	--	76.5	144.0
Transition quarter	43.5	--	1.0	--	44.5	25.5
1976-77	709.8	--	4.5	--	714.3	109.7
1977-78	446.4	--	5.0	--	451.4	137.8
1978-79	244.3	--	6.3	--	250.6	134.1
1979-80	1,274.0	--	5.8	--	1,279.8	156.8
1980-81	1,967.2	--	7.5	--	1,974.7	118.8
1981-82	2,231.3	--	7.9	--	2,239.2	28.1
1982-83	8/2,592.0	--	8.4	--	2,600.4	20.1

-- = Not applicable.

1/ Fiscal year begins July 1 until 1975-76; Oct. 1 thereafter.
2/ CCC support purchases and related costs (for processing, packaging, transporting, and storing) dairy products, less sales to commercial buyers for domestic use and for export, U.S. military agencies, foreign government and private welfare agencies, and Section 32 programs.
3/ CCC reimbursements to U.S. military agencies, Veterans Administration, and other participants.
4/ Expenditures of Section 32 funds to buy dairy products in the market and from CCC for school lunch and welfare uses. Purchases of dairy products at market prices under Sec. 709 of the Food and Agriculture Act of 1965 and under Sec 4.(a) of the Agriculture and Consumer Protection Act of 1973, for domestic school lunch and welfare uses.
5/ Value of payment-in-kind certificates issued by CCC on exports of nonfat dry milk, butter and other high milkfat products, and CCC cost of exports under Title I, P.L. 480 of dairy products not originating in CCC stocks.
6/ Expenditures under the program to increase milk consumption by children in schools, child-care centers, and similar institutions.
7/ Net receipt due to sales exceeding purchases.
8/ Reduced $253.8 for milk marketing deductions.

Source: Agricultural Stabilization and Conservation Service, USDA.

imports then held at about 1.5 percent of U.S. production to 1972. Substantially increased imports were permitted in 1973 and 1974, in response to sharply increasing milk prices in a period of rapid general inflation. These import actions had some effect on dairy prices, but some were badly timed and contributed to the wide fluctuations in manufacturing milk prices in those years.

Imports have been held to 1.5 to 1.9 percent of U.S. production since 1974. Imports of butter, nonfat dry milk, and American-type and processing cheese compete very directly with those products made in the United States and displace them essentially pound-for-pound. More exotic cheeses which are not made in the United States compete less directly with domestic products. If imports of such cheese were restricted, sales of other domestic cheeses likely would not increase by the same amount, perhaps not at all. The extent to which casein replaces domestic dairy products is more problematical. In some food products such as cheese and ice cream, there is very nearly pound-for-pound substitution. In other uses, particularly nonfood products, closing off casein imports would not increase the demand for U.S. dairy products (Economic Research Service, 1981).

Effects on Price Certainty and Stability

By assuring minimum prices, the support program reduces downside price risk to dairy farmers. Intra- and interseasonal price troughs are cut. Price peaks are also cut to the extent Government purchases are subsequently released into normal marketing channels. In reality, a small proportion of program purchases finds its way back to regular commercial users. However, support operations may also moderate future price peaks by reducing excessive cutbacks in production capacity during periods when prices would otherwise be more depressed.

The stabilizing effect of price supports is enhanced by the advance announcement of prices. Prior to passage of the 1981 farm bill, minimum support levels were fixed for 6- to 12-month periods. Prices could be raised during these periods, but could not be lowered without special legislation. This form of forward pricing allowed dairy farmers and processors to plan production and make investments on the basis of more predictable income.

The stabilizing influence of price supports contributes positively to economic efficiency. To the extent that dairy farmers or their lenders are risk-averse, the greater the risk associated with a farming enterprise, the greater the return required to induce investment in that enterprise. Moreover, stability facilitates more efficient planning and allows better use of fixed plants and equipment. Hence, to the extent that the price support program reduces price risk and stabilizes output, production is greater at any given average price than it would be without supports.1/

Direct measures of how much supply is enhanced by price support-induced stability are impossible because: (1) the program has operated so long that there is no appropriate time period without government involvement against which to make comparisons, (2) stability-related supply increases are confounded with increases

1/ Questions relating to the magnitude and desirability of milk price stabilization through Government intervention are addressed in detail by Leathers in a contributing study to this report.

in supply associated with prices above market-clearing levels, and (3) stabilizing effects of price supports cannot be separated from those of marketing orders.

Measurement is also hampered by a lack of knowledge about how much stabilization through Government programs and storage substitutes for stabilization that would otherwise be achieved through private storage. More private storage of dairy products would occur without supports, at least between flush and deficit seasons, because manufactured product prices would usually differ between seasons by an amount large enough to encourage storage.[1/]

Effects on Price Levels and Economic Efficiency

The support program has two major impacts on economic efficiency: a beneficial effect through stabilization as discussed above and a negative effect due to misuse of resources. The latter arises when high support prices bring resources into milk production that could be used elsewhere to better advantage.

If the sole objective of dairy price supports were to stabilize milk prices, then prices would be maintained at levels that would tend to equalize production and consumption over a period of years. If assurance of adequate supplies were interpreted to mean that milk shortages are more undesirable than surpluses, then average prices would be expected to be slightly above the level necessary to achieve supply-demand balance over the long run. In fact, support prices have periodically exceeded market-clearing levels for several months at a time. The Secretary of Agriculture had been granted limited discretionary power to reduce support levels when faced with chronic or escalating milk surpluses. However, the 1977 farm act effectively eliminated this flexibility leading to an extended period of surplus accumulation. The 1981 act substituted a fixed dollar support lend ($13.10) for the parity standard as long as surpluses remained at stated levels.

By any reasonable definition of adequacy, total U.S. milk supplies presently are more than adequate, particularly if uncommitted CCC stocks are included as part of total supply. Although the magnitude of the present surplus problem is unprecedented, regular CCC purchases have been the norm rather than the exception. The price support program has frequently exceeded its objective of assuring adequate supplies of milk. It has maintained productive capacity in excess of present and anticipated consumption needs.

The primary loss in efficiency from overly high price supports and surplus disposal arises because resources used to produce and transport surplus milk and transform it into storable products could instead be used to produce other goods and services of greater value to society. This misuse of resources is reflected in higher prices to consumers and costs to taxpayers for purchase and storage of surplus products.

Partly offsetting this social cost are benefits from distributing surplus products. The recipients of these benefits include school children, limited income U.S. consumers, and needy persons in foreign countries. In some cases,

1/ Further complicating measurement is the possibility that the CCC might be a more efficient storer of dairy products than the private sector, as suggested by Hallberg and King.

the social benefits from these distributions appear to be significant; in other cases, the benefits appear small. The economic losses due to misallocation of resources brought on by price supports depend on the deviation of support prices from market-clearing levels, the value assigned to donations, and the nature of milk supply and dairy product demands. If the donations had no value to society, the net loss would approach the over $2-billion current Government cost of the program. To the extent that the donations have a positive value to society, this loss is reduced.[1/]

To determine net social welfare effects of the dairy price support program, one must balance efficiency gains attributable to increased price certainty and stability against efficiency losses associated with excess production. Whether the net effect is positive or negative is not obvious. But the welfare losses do not result from the price support program per se. They result from recurrent milk surpluses caused by support prices persistently above market-clearing levels. Gains through stabilization and reduced uncertainty may be attainable with supports at lower levels. Net effects on social welfare clearly depend critically upon the level of support.

Effects on Income Distribution

The major income distribution effect of dairy price supports is a transfer from milk and dairy product consumers and taxpayers in general to dairy farmers. This transfer occurs whenever the program removes product from the market. As long as the program continues, a portion of this transfer is capitalized into the value of land and other assets especially suited for dairy farming, thereby benefiting landowners and some input suppliers.

Both the stabilizing and price enhancing aspects of the price support program have tended to slow the rate of exit from dairy farming. Agricultural lenders are more willing to supply funds when output prices have administratively fixed lower bounds. Price supports above market-clearing levels have permitted marginally efficient farmers to receive incomes high enough to forestall their exit from dairying. But program benefits accrue in proportion to the volume of milk production. The program is neither designed nor administered to provide greater benefits to smaller dairy farms.

By providing a stable market the dairy price support program has also probably kept some small manufacturing plants in business longer. Many of these plants tend to specialize in sales to the CCC (Williams, et al.). It has at the same time helped to stimulate the construction of large new manufacturing plants.

1/ One study estimated for 1973 that social costs of support prices at 80 percent of parity would have been $13 million, and $94 million at 90 percent of parity, if surplus purchases had been donated to U.S. consumers; $92 and $447 million if purchases had been destroyed or donated abroad (Buxton and Hammond). Actual social costs of price supports in 1973 were estimated to be zero since the 75 percent of parity support price in effect then was below market-clearing prices. Another study estimated the annual longrun net social benefits of dropping price supports to be nearly $500 million compared to actual policy in 1977, a year of relatively high support prices (Hutton and Helmberger).

Effects on Allocation of Milk to Products

Maintenance of milk prices through CCC purchases of American cheese, butter, and powder has affected the markets for these and other dairy products. Government purchase prices for these products are set to allow manufacturers a "make allowance" or processing margin while returning the specified support price to dairy farmers. The resulting value of milk in supported products, in turn, dictates its value in other products whenever support prices are effective prices.

The CCC periodically changes relative product purchase prices to reflect changing demands and to avoid becoming a "dump" market. Moreover, costs to manufacture and store the three supported products are probably lower than for alternative manufactured products that might be purchased to implement the support program. Considerable reserve manufacturing capacity for butter, powder, and cheese apparently exists during periods of normal supplies. The CCC is presently a major outlet for cheese and butter and has been the dominant market for nonfat dry milk powder for several years. Because of large support purchases, butter and powder markets have failed to adjust to declining commercial demand. Consumption of lower priced substitutes (e.g. margarine, caseine, and protein substitutes) have been encouraged by high support prices, causing further erosion of demand. Relatively high CCC prices for powder have served to reduce commercial use of skim milk for fortifying fluid products and in such manufactured products as mellorine and cottage cheese. Simply put, more milk is being used for butter, powder, and cheese, and less for products not purchased by the CCC than would occur without the program.

Milk Marketing Orders

Federal milk marketing orders set minimum prices which must be paid by processors to dairy farmers or their cooperatives for Grade A (fluid grade) milk in markets where producers have elected to come under Federal orders. Higher minimum prices are established for milk for fluid use than for regulated Grade A milk used in manufactured products. The proceeds from milk sales in each market are pooled and farmers receive a blend or average price.[1/] Thus, each farmer in a market shares the returns from higher priced fluid uses and lower priced manufacturing uses. Federal orders do not limit the quantity of milk produced or marketed. In 1981, 84 percent of the Nation's milk supply was Grade A and 45 percent of all milk sold was used for fluid products. Federal order receipts represented 69 percent of total milk marketings and 81 percent of milk eligible for fluid use in 1982 (table 10).

Milk used for fluid products is designated Class I. Most orders have two other classes: Class II includes milk used for soft products including fluid cream, ice cream, cottage cheese, and yogurt and Class III includes milk used for hard products including cheese, butter, and nonfat dry milk. Minimum class prices are established for nearly all of the 46 Federal marketing orders on the basis of specified relationships to the M-W price (the price of manufacturing grade milk in Minnesota and Wisconsin), so they automatically reflect changes in support prices. With a few minor exceptions, prices for milk used in manufactured

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1/ Forty-three of the 46 Federal orders had marketwide pools in 1983 and 3 had individual handler pools.

Table 10--Federal and State milk marketing orders, number and percentage of fluid grade milk regulated, selected years, 1940-83

Year	Orders		Fluid grade milk regulated by--	
	Federal 1/	State 2/	Federal orders 1/	State orders 2/
	- - - Number - - -		- - - - Percent - - - -	
1940	29	20	35	43
1950	39	16	41	24
1960	80	16	64	21
1970	69	17	80	18
1980	47	14	80	17
1982	49	13	81	17
1983	46	13	--	--

-- = Not available.

1/ Includes licenses and agreements in 1940. Number at any time during the year.

2/ Excludes States with concurrent regulation with Federal orders.

products are at or near the M-W price base. Minimum prices for Class I milk are higher by fixed differentials.

Class I differentials east of the Rockies, last changed in 1968, increase with the distance from the Upper Midwest, the most important source of Grade A milk supplies in excess of regional fluid needs. The geographical structure of Class I differentials corresponds closely to a basing point system with Eau Claire, Wis., as the base. Moving from Eau Claire, minimum order Class I prices increase at a rate of about 15 cents per hundredweight per 100 miles, which is less than half of current actual transportation costs. Actual Class I prices exceed the order minimum prices in most markets where cooperatives have negotiated over-order payments.

Federal orders do not directly determine or control the uses of milk; that is, the product forms in which it is eventually used. Rather, processors determine the uses based on known and anticipated orders from their customers for fluid milk products. The prices which processors must pay for milk going into different uses obviously influence the quantities used.

In earlier years, numerous barriers to movement of milk between areas were erected by sanitary regulations and product specifications of State and local health authorities and by other regulations. Almost all of these have been removed by court and legislative action. Federal orders do not prevent milk movements, although order prices and provisions relating to out-of-order raw milk have some constraining effect.

Evolution of Federal Milk Marketing Orders

The focus of Federal milk orders has shifted over the years. In the forties and fifties, milk markets were essentially local in character. Milk movements between markets were limited and markets were more isolated from the effect of the level of milk prices in other areas. Class I prices were considered primarily in terms of the appropriate level for a particular area and intermarket price alignment was secondary. Various methods of establishing Class I prices were used, including stated Class I prices, the use of price series for Midwest canned milk plants, and economic formulas which reflected changes in various economic factors such as cost of feed, farm wage rates, and general price levels. During the fifties, most orders operated with local supply-demand adjusters that adjusted prices up or down on the basis of changes in local supply-demand relationships. The resulting prices varied considerably among markets because of the different pricing procedures used and the effect of local supply-demand adjusters.

As milk keeping quality improved and refrigeration, transport, and roads improved, markets became less local in character and milk increasingly moved between markets. It became evident in the early sixties that a more closely coordinated system of Class I prices was needed with changes in national supply-demand conditions reflected simultaneously in all Class I prices. Also, it was necessary to give more weight to the cost at which milk supplies were available from sources outside a market's traditional milkshed.

In view of these developments, the M-W price was adopted in the sixties as the basic mover of all Class I prices and local supply-demand adjusters were phased out. The M-W series was selected because: (1) it was the best available indicator of changes in the overall supply-demand situation; (2) it was a measure (when appropriate differentials were added) of the cost of alternative supplies from the Upper Midwest; and (3) it provided a means of coordinating changes in Federal order class prices with changes in price levels under the dairy price support program.

Thus, the character of prices established under Federal orders became quite different. They were no longer subject to frequent change on the basis of changes in supply-demand conditions in individual markets. Instead, they became a coordinated system of prices for the various markets wherein the major factor moving prices up or down was changes in the national supply-demand situation and the price support level. Implications of this change were far reaching in terms of the character of Class I prices in milk orders. Changes in individual order prices would be made only in the context of a system of prices for all markets. This meant less opportunity to change individual order prices or prices for a group of markets in response to changes in local or regional supply-demand conditions.

Compared to the price support program, milk marketing orders are more complex instruments of Government intervention. Their numerous and diverse economic effects are described below according to major provisions and administrative policies.

Effects of Classified Pricing and Pooling

General effects of classified pricing and pooling are considered here, leaving analysis of specific price levels and class differentials for the next section.

Classified pricing is a form of administered pricing that involves pricing to processors by use and paying producers a blend price. Administered pricing means that price itself, or price bounds, are set by an organization, rather than being determined by bargaining in the marketplace. Federal orders set minimum prices for producers' milk while in most markets actual prices are set above the order minimums by producers' cooperatives. Use pricing involves setting prices based upon the use the buyer makes of the product or service.

Gains from administered pricing under Federal milk orders include: (1) increased certainty and stability in prices and market outlets, (2) prevention of unfair and deceptive trade practices such as below-cost pricing or shading weights and fat tests, and (3) more and better market information. Producers and handlers know class prices and can accurately forecast prices in advance. Buyers cannot legally undercut administered prices during flush milk production seasons or other periods of temporarily large milk supplies. Effects of price wars engaged in by bottlers, wholesalers, or retailers cannot be passed back to farmers.[1/]

Orders do not mandate which producers shall ship to which handlers, nor do they directly guarantee producers a market for their milk. But, their pooling and blend pricing provisions, in combination with a support program that assures a manufacturing outlet, reduce handler incentives to seasonally adjust their number of producers or source of milk. Producers' ability to maintain outlets is further enhanced by the orders' support for dairy cooperatives, many of which can absorb temporary imbalances between production and fluid use through their own manufacturing operations. Also, policing of weights and butterfat tests discourages dishonest accounting.

Much data collected in the process of classified pricing under orders is disseminated to the general public. This data consists of immediate "market news" information on prices and general supply and demand conditions as well as short- and long-term outlook information (price trends, and changes in utilization, for example).

These attributes of administered pricing under marketing orders relate closely to orderly marketing as referenced in the Agricultural Marketing Agreement Act. Compared to an unregulated market, Grade A milk prices are more predictable.[2/] Grade A producers have more assurance of "finding a home" for any milk in excess

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1/ Because cooperatives are entirely owned and controlled by their farmer members, a cooperative is regarded under Federal order provisions as an extension of the farmer. Thus, the minimum prices apply to prices paid by processors to cooperatives (or directly to farmers), but not to prices paid by cooperatives to their owner members. It might be possible under order provisions for a cooperative which was involved in bottling, processing, or retailing to engage in a price war and for monetary losses therefrom to be borne either directly or indirectly by member producers.

2/ Prices are also more stable, both within the year and between years. Greater stability in prices is accompanied by greater stability in production and utilization and, thus, generally more efficient use of facilities and equipment. An exception is that higher prices are needed in the fall than in the spring to help level out production over the year. Some orders include seasonal pricing plans to provide additional stimulus for evening out production over the season.

of fluid handler needs. Considerable market information is made available to assist producers and handlers in making short-term decisions and long-term plans. These orderly marketing conditions permit dairy farmers to borrow money more easily and invest in cows and equipment with greater confidence. The same milk prices consequently elicit greater production than without the order programs in place.

No system of administered pricing can fully and accurately reflect all of the value differences that would appear in an unregulated market. For example, transportation allowances under marketing orders grow out of date. And minimum order prices do not reflect differences in services that different suppliers provide along with the milk they sell. Keeping price differentials between use classes constant leads to misallocation as demand and the cost of supplying milk for different uses change. Because some milk is likely to be priced too high and some too low, movement into consumption is less than fully efficient. That is one reason why prices fixed under milk orders are minimum prices. Buyers and sellers are free to negotiate adjustments to cover changed marketing conditions.

Setting and enforcing payment of minimum prices under marketing orders has been described as promoting "constructive competition" (Forest). Each handler starts at par with its competition and, thus, competes on the basis of relative efficiency in processing and distributing rather than on the basis of procurement costs. Others have characterized uniform pricing as stifling competition among handlers. Equalized minimum prices reduce incentives for dairy processors to adopt new technology or develop alternative means of balancing supplies. But, administered minimum prices would restrict competition in the long run only if prices were set above levels dictated by supply and demand conditions. This issue is treated below. However, enforcement of minimum prices by itself does not seem to be inherently anticompetitive.

Minimum order prices limit the market power of fluid milk processors. The highly perishable nature of raw milk makes dairy farmers especially susceptible to the exercise of buyer's market power: the product cannot be stored when prices are deemed unacceptably low. Minimum prices preclude such exploitation and along with other order provisions enhance the market power of dairy cooperatives.

From their beginning, Federal marketing orders have set milk prices according to use class. Class pricing works for milk because actual use can be monitored. Buyers, as well as sellers, have generally found the system acceptable. Pricing by use class can also serve as a means to raise returns to producers by exploiting differences in demand for fluid and manufactured products. This generally requires setting fluid use prices above manufacturing use prices by more than the cost difference in supplying the two outlets. This will be discussed below.

Class I Differentials

The effects that stem from the specific levels of prices and especially from the price differentials between milk used for fluid purposes (Class I) and for manufactured products are considered in this section.[1/] Manufacturing class prices are fixed at the level of prices paid by unregulated Grade B manufacturers in

1/ Two classes of milk used for manufacturing are designated in most marketing orders, but this distinction is not important for evaluating effects.

Minnesota and Wisconsin and thus represent market-clearing or support level prices for manufacturing grade milk. Minimum Class I prices are fixed above the manufacturing class price by an amount that varies with the distance a particular market is located from the Upper Midwest. The size of the Class I differential is related to the higher costs associated with producing, procuring, and marketing milk for fluid uses relative to manufacturing uses. Depending on its level, the Class I differential may also reflect price discrimination: charging a price for milk destined for fluid uses that is higher than justified by cost differences over manufacturing milk in order to exploit a relatively inelastic demand.

The amount of the Class I differential that represents price discrimination, as compared to marginal costs of servicing fluid milk markets, is critical in evaluating effects of orders on producers and consumers and on overall economic efficiency. These marginal costs include additional costs of Grade A over Grade B milk production (mainly to meet higher sanitation requirements), order administration fees, and costs of providing for reserves to balance variations in fluid use (hauling costs, short-term storage, and costs of idling manufacturing facilities to free milk for fluid processors). Marginal costs for Class I use were estimated to average about $0.60 per hundredweight nationwide in 1977, but this figure included some costs for which dairy cooperatives imposed service charges to handlers over the order minimum Class I price (Manchester, 1978). Based on 1975 milk production costs and Class I utilization rates in the Eau Claire, Wis., area, Dobson and Buxton calculated that a $0.55 Class I differential would be necessary to return Grade A producers the same net return per hundredweight as Grade B producers. The Eau Claire zone differential for the Chicago Regional order in 1975 was $0.90.

Class I differentials have been constant since 1966 while manufacturing milk prices have risen. Class I differentials have consequently been a declining proportion of Class I prices (table 11).

Given that marketing orders are intended to provide an adequate but not excessive supply of milk for fluid uses, a possible indicator of prolonged price discrimination is the amount by which Grade A milk production exceeds that necessary to adequately supply fluid milk needs, including reserves. Surpluses would suggest that blend prices were higher than necessary to induce sufficient Grade A milk. Low Class I utilization rates are one measure of surplus Grade A milk production, but they fail to account for the reserves needed to balance production with needs. Reserve needs as a proportion of fluid use differ across markets depending on such factors as market size and other characteristics of buyers and sellers, and who is doing the balancing.

Table 12 shows Class I utilization of all milk regulated under Federal marketing orders for the 20 years ending in 1982, along with calculated surpluses (Grade A milk in excess of actual fluid use and reserve requirements). Reserve requirements are arbitrarily specified as 25 percent of fluid use (to reflect weekly reserve requirements) plus the difference between average daily Grade A marketings for the year and average daily marketings during the month of lowest production (to reflect seasonal reserve requirements). This method follows a procedure used by Dobson and Buxton.

Most of the growth in Grade A production during the last two decades has gone into manufactured products, not fluid use. Class I utilization as a percentage of

Table 11--Federal order Class I differential as percentage of Federal order Class I price

Year	All markets	Chicago Regional	Southeastern Florida
		Percent	
1966	30.5	--	46.2
1967	31.6	--	44.7
1968	33.4	22.7	43.2
1969	32.5	21.4	41.3
1970	31.0	21.5	41.2
1971	30.4	20.8	39.6
1972	29.6	20.1	38.6
1973	26.2	17.5	34.8
1974	22.4	14.8	30.2
1975	22.4	14.8	30.3
1976	19.6	12.8	26.8
1977	19.8	12.9	27.1
1978	18.4	11.9	25.3
1979	16.3	10.5	22.6
1980	15.3	9.7	21.3
1981	14.4	9.1	20.0
1982	14.7	9.2	20.2

-- = No Federal order.

production for the order system as a whole has trended downward, dropping about 18 percentage points from 1963 to 1982. Most of this decrease has occurred since the start of the current major production expansion in 1975. From 1975 through 1982, annual Class I sales have been virtually constant at 41 billion pounds, while Grade A deliveries increased 22.37 billion pounds, or more than 32 percent from their 1975 level. Since 1980, less than half of all Grade A milk marketed under Federal orders has been used for Class I products.

Implied surpluses of Grade A milk have increased correspondingly. For the order system as a whole, Grade A surpluses ranged between 10 and 16 percent of regulated deliveries in the sixties. They have exceeded 25 percent since 1976, climbing to over 40 percent in 1982.

Estimates of percentage utilization and surplus in 38 Federal order markets east of the Rocky Mountains for 1973 and 1980 are presented in tables 13 and 14.[1/]

1/ Changes from 1973 to 1980 must be interpreted with care since 1973 was a year of tight milk supplies and 1980 a year of growing surpluses. Comparisons with earlier years are more difficult because of changes in marketing order boundaries.

Table 12--Class I utilization and calculated surplus Grade A milk marketings for all U.S. milk under Federal orders, 1963-82 1/

Year	Producer marketings	Class I utilization		Calculated Grade A surplus 2/	
	- - Bil. lbs. - -		Percent of marketings	Bil. lbs.	Percent of marketings
1963	52.86	32.96	62.35	7.97	15.08
1964	54.45	33.97	62.38	8.23	15.11
1965	54.44	34.56	63.48	7.04	12.93
1966	53.01	34.80	65.65	5.31	10.02
1967	53.76	34.41	64.01	8.22	15.29
1968	56.44	36.49	64.65	9.19	16.28
1969	61.03	39.22	64.26	8.70	14.26
1970	65.10	40.06	61.54	11.14	17.11
1971	67.72	40.14	59.27	13.78	20.34
1972	68.72	40.94	59.58	11.81	17.19
1973	66.23	40.52	61.18	9.98	15.07
1974	67.78	39.29	57.97	13.96	20.60
1975	69.24	40.11	57.93	14.33	20.70
1976	74.59	40.98	54.94	20.28	27.19
1977	77.95	41.13	52.76	21.62	27.74
1978	78.09	41.01	52.52	21.92	28.07
1979	79.44	41.01	51.62	24.26	30.54
1980	84.00	41.03	48.84	28.69	34.15
1981	87.99	40.75	46.31	32.75	37.22
1982	91.61	40.80	44.54	36.74	40.10

1/ Includes all milk regulated under orders without regard to whether orders were in effect for the entire calendar year.

2/ Surplus is defined as annual Grade A milk marketings under the order that exceed Class I use plus weekly and seasonal reserves. Weekly reserves are defined to be 25 percent of Class I use. Seasonal reserves are defined as the difference between average daily Grade A marketings for the year and average daily marketings during the month of lowest production.

Table 13--Class I utilization for Federal milk marketing orders east of the Rockies, 1973 and 1980

Market	Regulated marketings, 1980	Class I utilization		
		1973	1980	Change, 1973-80
	Bil. lbs.	- - Percent of marketings - -		
New England* 1/	5.22	66.6	55.1	-11.5
New York-New Jersey	10.56	53.4	43.7	- 9.7
Mid Atlantic	5.63	64.5	51.5	-13.0
Upper Florida	.76	96.3	90.2	- 6.1
Georgia	1.54	89.5	77.0	-12.5
Tennessee*	1.26	81.7	73.1	- 8.6
Tampa Bay	.60	93.5	90.7	- 2.8
S.E. Florida	.77	93.2	93.7	.5
Chicago Regional	11.58	42.0	25.9	-16.1
So. Illinois	.95	61.0	59.3	- 1.7
Ohio	2.99	67.4	60.7	- 6.7
E. Ohio-W. Penn.	3.38	66.3	58.6	- 7.7
So. Michigan*	4.45	65.5	50.4	-15.1
Mich. Upper Pen.	.05	70.0	64.3	- 5.7
Louisville-Lexington	1.25	72.9	58.5	-14.4
Indiana	1.81	71.9	68.9	- 3.0
Central Illinois	.19	59.4	62.2	2.8
St. Louis-Ozarks	2.06	65.3	60.8	- 4.5
Greater Kansas City	.97	58.0	47.6	-10.4
Neb.-W. Iowa	1.19	57.8	44.4	-13.4
Upper Midwest*	8.49	38.6	17.9	-20.7
Neosho Valley	.01	56.0	47.9	- 8.1
Wichita	.40	78.8	49.1	-29.7
Black Hills	.08	59.2	62.9	3.7
E. So. Dakota	.28	45.2	48.2	3.0
Iowa*	2.17	58.6	34.7	-23.9
New Orleans-Miss.*	1.21	62.9	67.6	4.7
Greater Louisiana*	.59	85.4	85.5	.1
Memphis	.33	80.3	83.8	3.5
Nashville	.62	73.8	55.8	-18.0
Paducah	.08	88.8	86.7	- 2.1
Red River Valley	.04	76.1	77.8	1.7
Okla. Metro	.95	69.8	64.4	- 5.4
Cent. Ark.-Ft. Smith 2/	.41	87.5	82.8	- 4.7
Lubbock-Plainview	.07	92.3	90.6	- 1.7
Texas*	3.59	75.2	76.8	1.6
Texas Panhandle	.10	85.8	85.1	- .7
E. Colorado	.90	74.5	73.0	- 1.5
All marketing orders	84.00	61.2	48.8	-12.4
Total United States	3/ 126.19	49.6	44.2	- 5.4

1/ Markets denoted with an asterisk were defined differently in 1973 and 1980 and utilization data are constructed using similar marketing areas.

2/ Combined markets.

3/ Total production under Federal and State regulation plus Grade B production.

Table 14--Surplus Grade A milk marketings under Federal milk marketing orders east of the Rockies, 1973 and 1980 [1/]

Market	Regulated marketings, 1980	Surplus		
		1973	1980	Change, 1973-80
	Bil. lbs.	- - -Percent of marketings- - -		
New England* [2/]	5.22	6.8	24.6	17.8
New York-New Jersey	10.56	21.4	38.3	16.9
Mid Atlantic	5.63	13.5	31.8	18.3
Upper Florida	.76	-30.0	-28.4	1.6
Georgia	1.54	-24.3	-11.5	12.8
Tennessee*	1.26	-16.1	- 5.9	10.2
Tampa Bay	.60	-28.8	-30.3	- 1.5
S.E. Florida	.77	-28.4	-29.9	- 1.5
Chicago Regional	11.58	34.0	58.7	24.7
So. Illinois	.95	16.7	14.0	- 2.7
Ohio	2.99	5.6	18.1	12.5
E. Ohio-W. Penn.	3.38	8.2	18.1	9.9
So. Michigan*	4.45	14.0	32.7	18.7
Mich. Upper Penn.	.05	5.9	1.7	- 4.2
Louisville-Lexington	1.25	- 2.1	15.8	17.9
Indiana	1.81	0.6	7.9	7.3
Central Illinois	.19	20.2	9.5	-10.7
St. Louis-Ozarks	2.06	8.4	17.7	9.3
Greater Kansas City	.97	19.4	28.2	8.8
Neb.-W. Iowa	1.19	18.3	36.5	18.2
Upper Midwest*	8.49	35.6	69.6	34.0
Neosho Valley	.01	0.8	- 2.1	- 2.9
Wichita	.40	- 9.2	30.8	40.0
Black Hills	.08	6.5	7.5	1.0
E. So. Dakota	.28	36.6	31.2	- 5.4
Iowa*	2.17	13.5	49.5	36.0
New Orleans-Miss.*	1.21	-22.1	- 5.8	16.3
Greater Louisiana*	.59	-18.8	-14.8	4.0
Memphis	.33	-22.5	-12.4	10.1
Nashville	.62	- 3.6	19.9	23.5
Paducah	.08	-20.8	-25.2	- 4.4
Red River Valley	.04	- 6.8	- 9.5	- 2.7
Okla. Metro.	.95	4.0	8.6	4.6
Cent. Ark.-Ft. Smith [3/]	.41	-18.2	-12.5	5.7
Lubbock-Plainview	.07	-22.3	-27.0	- 4.7
Texas*	3.59	- 2.4	- 2.8	- .4
Texas Panhandle	.10	-25.2	-15.7	9.5
E. Colorado	.90	4.7	5.2	.5

1/ Surplus is defined as annual Grade A milk deliveries under the order that exceed Class I use plus weekly and seasonal reserves. Weekly reserves are defined to be 25 percent of Class I use. Seasonal reserves are defined as the difference between average daily Grade A marketings for the year and average marketings during the month of lowest production.

2/ Markets denoted with an asterisk were defined differently in 1973 and 1980 and surplus values are constructed using similar marketing areas.

3/ Combined markets.

Class I utilization percentages declined in all but nine of these markets; Grade A surpluses increased in all but 11. In the three largest markets based on 1980 marketings (New York-New Jersey, Chicago Regional, and Upper Midwest) accounting for 36.5 percent of total order Grade A receipts, surpluses increased by substantially more than the order system total. By 1980, 16.75 billion pounds or 54.7 percent of the combined Grade A deliveries to these three markets was in excess of fluid use plus reserves. While these areas serve as a reservoir of milk for filling shortages elsewhere, it is highly unlikely that excess supplies of such magnitude are needed as reserves for other markets.

The surplus values in table 14 indicate a general shift toward regional self-sufficiency in fluid milk. In 17 markets that were deficit in Grade A milk supplies in 1973 (negative surplus values in table 14), 8 decreased the amount of deficit by 1980, and 3 became surplus markets. For the six markets that became increasingly deficit, the change was less than 6 percentage points, averaging 2.5 percent. For the markets that increased their degree of self-sufficiency, increases in surplus percentages ranged from 1.6 to 40 percent, averaging 13.8 percent. Increasing self-sufficiency appears most evident in the Southeast.

The growth in Grade A production beyond that used as fluid and needed for reserves represents an inefficiency that is a joint result of the price support program, the marketing order program, and other factors.[1/] The root cause of the Grade A surplus is support prices that were set too high. However, price supports operate directly only on the price of manufactured milk. By setting minimum class differentials and reinforcing cooperatives' abilities to maintain over-order prices, the order program extends these price raising and surplus creating effects to producers who are primarily involved in supplying milk for fluid consumption. This has occurred even though Class I differentials have declined in real terms since 1968. Without market orders, the price raising and surplus creating effects of price supports would have been confined more closely to areas primarily engaged in supplying milk for manufacturing. Separating the effects of factors contributing to increasing Grade A surpluses appears impossible. High support prices have clearly been the major factor since 1979, but Grade A surpluses grew substantially during earlier years when price supports and Government surplus removals had relatively small effects.

Grade B conversion also partly indicates Class I prices which are higher than necessary to obtain adequate fluid milk. Many producers, particularly in the Upper Midwest, have switched to Grade A production in order to share in marketing order pools, even though their milk continued to be used for manufacturing. This suggests that there were surplus profits from Class I sales to be shared. These surplus profits are most likely the result of price discrimination.

A further indication that opportunities for excess revenues exist is that, in some cases, firms are willing to haul milk to another pool plant, run it through the plant, and haul it back again, merely to meet the shipping requirements to

1/ For example, cooperatives in the Upper Midwest with both Grade A and Grade B producers frequently distribute their receipts so as to "overpay" the order blend price to Grade A producers and "underpay" the manufacturing value of Grade B milk. This may reflect a quality difference (showing up in manufactured product yields and grades) or it may be a more direct incentive to encourage conversion.

share pool proceeds. Without revenue distortions, manufacturers would tend to be indifferent whether they or their producers were in the pool, and would not be motivated to engage in such high-cost activities.

To the extent that it exists, price discrimination represents an inefficiency, reducing total economic product for society. The magnitude of this effect depends upon the shapes and the price responsiveness of demand and supply curves and the amount by which price differentials between classes exceed cost differences. Estimates by Hutton and Helmberger and Dobson and Buxton suggest that the net loss to society was in the neighborhood of $12-13 million per year during the midseventies. This does not include costs of administering orders. Masson and Eisenstat estimated net social losses of $71 million annually prior to 1975. None of these studies attempt to measure the stabilization benefits attained through order pricing.

To the extent that the system contains price discrimination, it redistributes income from fluid product consumers to Grade A dairy farmers and manufactured product consumers. To the extent that Grade B milk prices are depressed by Grade A surpluses, there is an added income transfer from Grade B producers to Grade A producers and manufactured product consumers. It is generally agreed that transfers far exceed deadweight losses in magnitude (Buxton; Ippolito and Masson).

In some markets, USDA has allowed plants that ship little or no milk to the fluid market to participate in marketing order pools, thereby, making their producers eligible for blend prices. This has apparently been a conscious decision to make marketing order benefits available to more producers without forcing inefficient shipments of milk. But, liberal shipping requirements have amplified other incentives for dairy farmers to convert from Grade B to Grade A production and thereby helped erode the base for the M-W price, which measures pay prices for Grade B milk.

Regardless of cause, excessive Grade A supplies have resulted in transportation inefficiencies. The problem of inefficient round trip shipments of milk merely to meet qualification requirements has been noted. Fluid milk supply boundaries have, in some cases, been pushed well beyond their "natural" positions relative to consumption centers.

Similarly, some butter, powder, and cheese plants in markets with large surpluses of Grade A milk are located close to consumption centers. These plants would normally be expected to be positioned in distant producing areas relative to consumption centers in order to take advantage of volume reduction via processing.[1/] Pooled manufacturing plants pay the order manufacturing class price for Grade A milk f.o.b. their plants, and are thus indifferent as to location. Since they are specialized in manufacturing, some of these regulated handlers are reluctant to divert milk to bottlers without receiving a payment to compensate them for the opportunity cost associated with foregone manufacturing profits and higher per unit fixed costs. Some of these plants are true balancing plants and unquestionably are needed to supply fluid milk during periods of short supply. But, the

1/ Many of these plants were built prior to expansion of urban centers; pooling has permitted them to remain in manufacturing even though they lie well within the "natural" fluid milk procurement areas of the expanded cities.

existence of large volumes of Grade A milk in excess of maximum fluid needs along with limited seasonal variation in manufactured volume suggests that many such plants view balancing as a secondary or peripheral function.

These effects related to the location of fluid and manufacturing milk production and processing illustrate a fundamental dilemma regarding classified pricing and marketwide pooling. Equity among Grade A producers is promoted in the sense that all share in the higher returns associated with servicing the fluid milk market. But equity comes at a cost of inefficiency if blend prices attract Grade A production well in excess of the level necessary to service the fluid market or if Grade A milk could be supplied at a lower cost through other means.

Separating Geographic and Product Markets

Maintenance of classified pricing requires rules preventing arbitrage to take advantage of price differences between products or locations that exceed corresponding cost differences. If handlers could process and sell fluid milk products made from milk purchased at manufacturing class or blend prices they would have a competitive advantage. The classified pricing structure would also be eroded if ingredients made from milk purchased at manufacturing class or unregulated prices were reconstituted and sold as fluid milk. Other rules apply to the geographical alignment of prices and the treatment of milk imports from unregulated areas.

The basing point system used for setting minimum Class I prices does not adequately reflect relative costs of production or the location of surplus production. Intermarket milk movements to meet shortages are distorted and transportation costs are elevated. Relatively high Class I prices in the Northeast, for example, induce deficit markets nearby to obtain fluid milk from more distant areas toward the Midwest basing point, even though ample supplies are available in a different direction.

Purchases of milk by handlers regulated under one order from producers or producer organizations pooled under another order are subject to down-allocation; the imported milk is assigned to use classes in accordance with the lower of the importing market or importing handler utilization. Imports from unregulated areas are subject to compensatory payments as well; the importing handler pays an amount into the pool equal to the difference between the order Class I price and the blend price on the amount of milk allocated to Class I. The purpose of these impediments to free milk flows is to equalize raw milk costs among handlers in the same pool and to discourage interorder milk shipments when local fluid supplies are adequate. However, these provisions are blind to the actual supply-demand situation; they may discourage needed milk flows or increase their cost.

Spatial equilibrium models have demonstrated the distortion in regional price, production, and trade patterns attributable to geographical price alignment under marketing orders (e.g. Hallberg, et al., 1978; Fallert and Buxton; Riley and Blakley). Compared to an unregulated market, the effect has been to raise fluid milk prices and blend prices in areas distant from the Upper Midwest which are normally self-sufficient in fluid milk production, including adequate reserves. This, in turn, means that orders have tended to expand milk production, producers' incomes, and dairy product manufacturing in such areas. In the absence of price supports, this would have reduced prices of manufacturing milk and producers'

incomes in the Upper Midwest. Regional distortions in prices and production due to marketing order minimum prices are now less than during the early seventies because Class I location differentials have diminished relative to transportation costs.

Order pricing provisions obligate processors who sell packaged fluid milk products made by reconstituting manufactured products (e.g. nonfat dry milk and butterfat) to, in effect, pay Class I prices for the milk equivalent of the constituent ingredients. This rule is intended to equalize costs among handlers. Its effect is to prevent possible displacement of locally produced or other Grade A milk which would erode fluid utilization rates and lower producer blend prices. Besides this economic restriction attributable to Federal orders, many States prohibit the sale of reconstituted milk products.

Little is known about how closely reconstituted milk would substitute for whole fluid milk if both were routinely available. But, assuming the consumer acceptability of reconstituted milk or whole-reconstituted blends at minimum solids-not-fat levels, studies have shown that significant savings in fluid milk costs could be achieved in some markets if ingredients were priced as Class II products (Federal Register; Novakovic, 1982). Economic incentives for reconstitution would exist mainly in the high cost-of-production areas, since associated processing costs would exceed other cost savings elsewhere.

Order treatment of reconstituted milk is indicative of more general impediments to the adoption of technologies that have the potential to reduce balancing costs or milk transportation costs. Order pricing provisions treat milk as a highly perishable product; thus, local supplies are encouraged where possible to minimize the time between production and consumption. While raw milk remains as perishable as when order legislation was enacted, techniques for prolonging the storage life of processed milk have evolved. Continued reliance on daily, local supplies for fluid products and reserves is questionable if less costly supplies are available from other areas or in storable forms.

Seasonal Production Stability

Marketing orders allow the use of seasonal incentive/disincentive plans designed to reduce peaks and valleys in milk production. Dobson and Buxton concluded that these plans have been generally successful in achieving their evening function, but were unable to determine whether the benefits obtained from reducing seasonality exceeded the costs of obtaining such reductions. The effect of such stabilization has been to more closely match production with consumption requirements, thus, reducing seasonal fluid reserve requirements.

Cooperatives and Federal Orders

Cooperatives have always had a significant role in Federal milk marketing orders. USDA has held that the initiative for a market order must come from the cooperative or cooperatives. Since at least 1960, more than 80 percent of the producers in Federal order markets have been cooperative members. In the early sixties, larger producers tended to remain outside the cooperatives. But, by 1978, cooperative and noncooperative members averaged almost the same size.

In December 1980, the major cooperative association represented at least 80 percent of the producers in a third of the orders, but these were in small markets

accounting for only 17 percent of the milk marketed under all orders. On the other hand, 13 percent of the orders in which the major cooperative represented less than 30 percent of the producers were in large markets accounting for 41 percent of the total milk marketed under orders.

Federal marketing orders provide an environment conducive to the development and maintenance of market power by dairy bargaining and marketing cooperatives:[1/]

> Administered pricing sets a floor under handler prices, which limits price shading by competing producers. Minimum order prices serve as a bargaining base in negotiations with handlers.[2/]
>
> Orders limit the ability of handlers to obtain less costly milk supplies from other orders or unregulated sources. Pooled noncooperative Grade A producers in surplus areas must be paid at least the surplus order blend price rather than the lower manufacturing milk price. Down allocation and compensatory payments further increase the cost of obtaining outside supplies.
>
> Reblending privileges granted by orders allow cooperatives to redistribute milk receipts across marketing orders and thereby pay some producers more than order blend prices and others less. In this way, cooperatives can attract members from among independent producers in one market at the risk of losing them in another.
>
> Order auditing procedures assuring honest accounting of milk use, weight, and tests and the provision of market information help provide an open bargaining environment and prevent concealed undercutting of prices by handlers.

In addition to these market power enhancing features of orders, cooperatives are allowed to bloc vote their membership in referenda to initiate and amend orders. Besides these order related privileges, the Capper-Volstead Act provides general support for marketing cooperatives by granting limited antitrust immunity. But the act also prohibits cooperatives from unduly enhancing prices by monopolization or restraint of trade.

Within this favorable environment, dairy cooperatives play a major role in representing members in bargaining negotiations with handlers, in coordinating fluid milk supplies geographically and temporally, and in processing surplus Grade A milk. Cooperatives are also increasingly integrating into bottling and fluid milk distribution in direct competition with proprietary bottlers.

Class I over-order payments are the source of considerable controversy. The polar positions are: (1) Such payments are *prima facie* evidence of monopolization by dairy cooperatives, who should be prosecuted under the Capper-Volstead

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1/ See Interagency Task Force, Christ, or Masson and Eisenstat for an expanded discussion of the interrelationships between marketing orders and dairy cooperatives.

2/ On the other hand, minimum order prices also serve as a guard against cooperatives abusing market power by engaging in predatory pricing in an attempt to drive out competing cooperatives.

Act for unduly enhancing prices, and (2) The payments reflect local supply-demand conditions and compensate cooperatives for providing services to handlers. Except for a general elevation of over-order charges during 1973-75 (when minimum order Class I prices dropped sharply while feed prices escalated) and some inflation related increases, no strong temporal patterns are apparent. Over-order payments are higher in Southeastern and South Central markets, where hauling costs from regions of large Grade A surpluses are high.

Based on annual data for several years, Babb, Bessler, and Pheasant concluded that the major factors influencing the level of over-order payments is the amount by which order minimum Class I prices fall short of the cost of alternative milk supplies. That is, over-order payments tend to be higher in markets where actual hauling costs for supplemental milk supplies are greater than allowed for in the order basing point system. The study found no evidence that over-order payments were related to cooperative concentration.

Capponi compared Class I over-order payments with cooperative pay prices and concluded that, at least since 1976, over-order payments have about covered costs except for a few markets. His study suggests that cooperatives must obtain substantial payments above minimum Class I prices merely to permit them to return order blend prices to their members.

These studies and others suggest that over-order payments have recently substituted for adjustments in Class I differentials as a means to cover higher costs. Over-order charges appear to increase in response to increases in the number of services provided handlers by dairy cooperatives and the cost of these services. Over-order pricing represents a move away from government administered pricing. Prices are, consequently, more market oriented, but dairy farmers are provided less price assurance.

Over-order payments generally do not appear to reflect abuse of market power by cooperatives. In fact, some apparently do not cover the cost of services that cooperatives provide to fluid processors. But it is unlikely that all over-order charges can be justified on the basis of costs of providing services. Averages hide substantial variability among markets: some over-order payments seem clearly out of line with adjacent market and some reflect price discrimination beyond that associated with order Class I differentials. Wherever the level of over-order payments has exacerbated surplus Grade A milk production or where effective Class I prices are maintained above costs of alternative supplies, inefficiencies are engendered.

The market shares necessary to effectively negotiate over-order charges were obtained through the mergers of many small local cooperatives into large regional units during the sixties and early seventies. But, large regional cooperatives also contribute to technical efficiencies in fluid milk assembly. Milk hauling costs are reduced by the elimination of duplicate routes. Balancing costs are reduced by spreading the balancing function over handlers and markets with different needs and concentrating surplus milk manufacturing in larger plants.

Government Costs

Government costs of the milk order program are modest. Expenses of market administrators are recovered by an assessment on processors. Expenses of market administrators totaled $25.4 million in 1982 and are estimated at $27.5 million

in 1983. Headquarters expenses in operating the milk order program are paid from appropriated funds, although consideration is being given to seeking authorization to recover them as a user fee. These costs were $2.5 million in FY 1982.

Related Programs

Several other Federal programs besides price supports and marketing orders have major impacts on the U.S. dairy industry. These include the food distribution programs and cooperative policy.

Distribution Programs

The Federal Government initiated a number of programs to encourage consumption of dairy products during the Depression. Purchases for distribution to schools, families, and institutions were authorized in 1935. The National School Lunch Act of 1946 made the program permanent, providing a subsidy for school lunches that included milk. Free or reduced-price lunches were provided for those who could not afford the full price. Nearly 50 percent of all school lunches are now provided free or at a reduced price.

School milk service was extended to nonlunch hours in 1954. Under the Special Milk Program, low-priced milk was made available to all students once and sometimes twice a day. This program has since been greatly reduced. A School Breakfast Program, primarily for students from low-income families, was initiated in January 1967. Up to 7 percent of total fluid consumption was used in these child nutrition programs in some years, with much of it a net addition to milk consumption.

The Agricultural Act of 1954 authorized CCC to subsidize purchases by the military and the Veterans Administration of dairy products acquired under price supports for use in addition to their normal market purchases. This program has been discontinued. These programs generally increased modestly the consumption of fluid milk and, to a lesser extent, the consumption of other dairy products.

Compared to dairy price supports and Federal marketing orders, the effects of special distribution programs have been small. Domestic and foreign feeding programs provide noncommercial outlets for dairy products purchased by the Government under the price support program. These programs have positive nutritional effects on recipients, but, except for the cheese and butter giveaways of late, can utilize only modest quantities.

Federal Cooperative Policy

Federal policy fosters the growth of cooperatives to redress the imbalance of market power between farmers and those who buy from them. But limits are put on the exercise of cooperative power. The Capper-Volstead Act permits farmers or farmer cooperatives to act together in marketing without automatically running afoul of the antitrust laws. But, it is not a blanket exemption from such laws. Once farmers have joined together in a cooperative, they are subject to the remaining antitrust and fair trade laws just as any other firm. The exemption does, however, permit the formation of a cooperative with an element of a monopoly in the marketing of a particular commodity for a particular market. Section 2 of the act provides safeguards to prevent abuse of the monopoly power.

Relationships Among Programs

The milk order program, price support program, and cooperative bargaining have become more closely interrelated in recent years. Milk order class prices are based upon the M-W price series which, in turn, is influenced by the support level. When market prices are at support levels, changes in the support level are directly reflected in the M-W price and in class prices. Use of the M-W price as the mover of class prices in all Federal order markets provides coordination between the milk order and price support programs, assuring that minimum class prices will not keep rising at a time when increasing purchases might require a reduction in the support level. The main means of changing class prices is through market forces reflected in the price paid for manufacturing grade milk.

By providing price assurance and perhaps price enhancement, the milk order program and cooperative bargaining for over-order payments complement the price support program. This reduces somewhat the reliance that must be placed on price supports for stabilizing dairy producers' incomes. However, in times of surplus, the additional dollars generated by milk orders and cooperative bargaining and received by dairy farmers may aggravate the supply-demand imbalance by calling forth unneeded milk supplies.

FUTURE SETTING FOR DAIRY POLICY

The underlying technological, demographic, and economic trends affecting the dairy industry are identified in this section which describes the environment in which dairy programs will be operating during the remainder of the eighties. This sets the stage for the next section where the effects of alternative programs operating within this environment are described.

Supply

Continued increases in output per cow during the eighties will stem from a combination of genetic advances, improved production technology and management, and substitution of concentrate feeds for other inputs. Increases in genetic potential through selection of better sires and even more extensive use of artificial insemination will be substantial. Further rises because of improved feeding, health, and reproductive management can be expected. Concentrate feeds likely will remain a relatively inexpensive input, providing continued incentive to devise ways of enabling cows to handle heavier feeding rates. Milking three times per day will likely become more commonplace. Annual increases of about 2 percent in milk production per cow are likely as a continuation of forces already in motion.

Other factors might start to accelerate gains in output per cow toward the end of the decade. Embryo transplants allow faster genetic improvement through the female side. Isolation of the female component of semen for artificial insemination also would accelerate genetic progress. Hormone treatment, spurred by genetic engineering, may be particularly promising.

Average herd size will continue to increase. Cost savings from replacement of labor by capital inputs are more pronounced in larger units. Herd size will increase as dairy farms specialize in milk production and devote fewer resources

to the production of feed and other commodities (particularly in areas where active forage markets emerge). In addition, the number of multiple operator, family operations probably will continue to increase.

Dairying will generally become more concentrated in existing dairy areas (even within States) which are particularly well suited for milk production. Exceptions to this pattern will occur where areas particularly well adapted to new technologies for milk or forage production become new milk production pockets. Dairying will remain strong in the Lake States and Northeast, continue to decline in the Corn Belt and Northern Plains, follow diverse trends in the Southeast, and grow in the West.

Processing and Marketing

The size of manufacturing plants will continue to increase. Very large new or renovated plants will each replace several old plants as current capacity becomes outmoded. Average size of fluid operations will also grow, but more slowly than manufacturing plant size because of the importance of distribution costs. Some mergers of cooperatives may occur, but dramatic changes in cooperative numbers is not expected.

Joint ventures among cooperatives and between cooperatives and proprietary operations probably will become more common. Joint ventures to minimize costs of raw milk procurement or product distribution are now fairly widespread and will remain so. Joint manufacturing and marketing operations are likely to increase. Such arrangements provide a relatively simple way for cooperatives to expand their geographic market and gain access and expertise beyond the basic processing level. From the proprietary side, joint ventures with cooperatives offer sources of milk, primary products, and capital. Some direct integration can also be anticipated, but it probably will be less pronounced than in the past.

Changes in the location of manufacturing capacity will follow changes in the location of milk production in excess of fluid needs. In some areas, changes in Federal order provisions could have a major bearing. However, manufacturing will remain quite important in the Upper Midwest and capacity, especially for cheese, will grow in the Pacific region. Manufacturing probably will fade in the Corn Belt and Northern Plains. In the manufacturing areas, capacity will be shifted from butter-powder into cheese. Operations manufacturing reserves from the fluid market may need to shift more toward cheese production as well. The most likely means of entry is the formation of balancing systems, incorporating a cheese plant and butter-powder capacity to bear the brunt of the variability.

The most significant technological advances probably will continue to be subtle improvements of existing processes. However, some emerging technologies may be important by the end of the decade. Use of membrane filters to remove water from whey has already affected the production and expanded the uses of whey products. Membrane technology also has promise for some cheese varieties, where yields are substantially boosted by retention of whey proteins in the cheese; it is less likely to be used at the farm level or in the fluid industry in the foreseeable future. Shelf-life of fluid products may be substantially extended. Aseptic packaging of pasteurized milk may develop, particularly in areas outside major population concentrations. Sterile milk (processed in ultra-high temperature pasteurization and packaging systems) will be available but will not be a major force unless cheaper packaging is developed.

Demand

Fluid milk products probably will continue to slowly lose market share in the total beverage market. The past erosion has been fairly steady and has occurred despite declining relative milk prices. However, demographic shifts indicate that the rate of decline in per person use might slacken. The offspring of the "baby boom" generation will raise the proportion of the population in the peak consuming ages, while that generation itself will start to move out of the lowest consuming, young adult category. Growth in total sales of fluid products during the next decade could range from none to a rate slower than population growth.

Within the fluid products, substitution of lowfat milks for whole milk is likely to continue. Only a couple of markets have reached the point where further substitution is questionable, and both fat content and relative price will remain important consumer considerations. Skim milk sales per capita probably will remain at the level of the past two decades because of the substantial perceived difference in taste.

Regional shifts in fluid milk consumption will follow, to a large extent, shifts in population. Between 1980 and 1990, population growth in the Mountain, West South Central, Pacific, and South Atlantic regions is expected to substantially surpass the U.S. average rate. Only slight growth is projected for the West North Central, New England, and East North Central regions, and the Middle Atlantic region faces a loss. In addition, declines in per capita use may continue to be larger in northern markets than southern markets. Migrants to the South have to adjust to higher milk prices but probably retain some of the higher consumption habits of the North, strengthening the average rate in southern markets.

Fluid sales are expected to increase strongly in the Mountain region, while growing more slowly in the South Atlantic, West South Central, and Pacific regions. Substantial declines are anticipated in the northern regions, particularly in the Middle Atlantic States.

The demand for cheese is likely to grow. Among the attributes of cheese that appear to be aligned with changing life styles are ease of preparation, range of flavors and textures, storability, and affordability. Acceptable alternative cheeses have been developed for consumers concerned about the high fat or salt content of some traditional varieties. There is no evidence that use is near a saturation level. However, the growth rate probably will slacken. As the cheese market continues to mature, growth will have to come increasingly from consumers who are already aware of the available varieties and their uses. Increasing proportions of consumers will reach the point where habit formation no longer boosts cheese use. In addition, imitation cheeses may capture a disproportionate share of further growth. Increases in commercial cheese use may slow in both absolute and proportional terms.

Demand for butter appears to have stabilized since the early seventies after declining for decades. Changes in use since then seem to have been mostly related to changes in butter prices relative to margarine. Per capita sales most likely will be fairly stable at slowly declining relative prices. Cream sales probably will continue to inch upward. Demand for milkfat products could be strengthened if butter-margarine blends and dairy based whipped toppings are successful. This would be reflected as much in relative milkfat prices as in quantities.

Nonfat dry milk sales are likely to decline further. Use in nondairy products could drop to insignificant levels and dairy ingredient and direct home use could be substantially lower. Commercial sales of nonfat dry milk are already so low, however, that expected losses will have relatively little impact on overall demand for milk.

Production and use of whey products, particularly whey protein concentrates, probably will show strong expansion. Increased cheese production and environmental regulations that limit whey disposal will enable whey protein concentrates to continue to fill the role (formerly held by nonfat dry milk) of an inexpensive source of very high quality protein. Increased demand for whey products can have, at most, a minor impact on overall milk demand since it involves, in part, recovery of milk components not now utilized.

Per capita commercial use of dairy products likely will be about steady unless real prices change drastically. This translates into approximately a 1-percent annual growth in the total market. Substantial maturing of the cheese market or accelerated inroads of imitation cheeses could weaken demand, while recovery by milkfat products or stabilized levels of nonfat dry milk sales could produce slow growth in the per person level.

Structural Adjustment in Dairy Farming

The current size of the national cow herd is clearly much larger than is needed to supply milk for commercial use. A reduction of about 10 percent (depending on the extent to which prices are lowered to spur commercial use) would be needed to reestablish a supply-demand balance. Further decreases will likely be needed to maintain this balance in the future. The difference between the expected gains in output per cow and the growth rate of commercial use implies annual declines in milk cow numbers of 0.5 to 1.5 percent.

Since average herd size probably will continue to increase, percentage declines in the number of dairy operations will need to be greater than in cow numbers. Old or inefficient dairy facilities will be abandoned as operators retire or shift to more profitable alternatives. Opportunities for off-farm employment and the profitability of alternative farm enterprises will have a major bearing on the rate of exodus from dairying.

The exit of human resources and land from dairying is not new. But future structural adjustment will be somewhat different from that of past decades. Much of the earlier adjustment came as multiple enterprise farm units abandoned the dairy enterprise. The bulk of future change will result from the exit of more specialized dairy farm units.

Regional Balances in Fluid Milk Markets

Geographic distribution of milk production generally will be less closely tied to population in 1990 than in 1980. Areas that had output in excess of fluid needs in 1978-79, a year when total production and use were nearly balanced,

will tend to have larger surpluses by 1990, while deficit markets become more so. There will be some regional exceptions.1/

The two major areas under the Federal orders which have not produced enough milk to provide all of their reserves (except during periods of large general surplus) are the Texas-Louisiana-Arkansas area and Georgia-Florida. Both areas probably will have greater deficits in 1990 than in 1978-79. Local milk production is not expected to keep pace with the increases generated by rapid population growth. The East South Central region may be less able to provide reserves for the South Atlantic deficit area, as declines in output outweigh slight declines in fluid sales. The Maryland-Virginia-North Carolina area is the only one in the South likely to have growing reserves.

The Northeast, particularly the Middle Atlantic States, will be an area of substantially larger reserves. Milk production is likely to remain relatively strong, while fluid needs drop. The Northeast may approach the point by 1990 where milk output equals regional consumption of all dairy products.

However, the growth in the region's reserves will be centered in Minnesota, Wisconsin, Michigan, and possibly Ohio. Other States in the region may have declining fluid reserves as the exodus of milk production surpasses declines in fluid sales.

The West is likely to be a region where both milk output and fluid needs grow. The Pacific region will become an increasingly important surplus area as production gains outstrip slow growth in fluid needs. Some of the Mountain States appear to have considerable potential for expanded milk output, depending upon the growth in milk production and the fluid needs generated by rapid population growth. Throughout the West, availability and price of water for forage production will be an important source of uncertainty.

Concentration of production, within both regions and markets, and the population shift away from major metropolitan areas will alter the pattern of milk flows needed to serve fluid markets. The concept of supplying a central city from zones of dispersed production will have decreasing relevance. The system increasingly will have to contend with questions of how to most efficiently provide milk to consumption areas from specific pockets of reserve milk.

PROGRAM ALTERNATIVES

Federal dairy programs for the remainder of the eighties will be chosen from a range of alternatives which includes continuing existing programs with modifications, introducing new types of programs, eliminating Federal intervention altogether, and various intermediate possibilities. Major alternatives are described in this section and likely effects of their implementation are discussed.

1/ The geographic distribution of milk production can be affected by the minimum price differentials set by marketing orders. Trends discussed here are based on the assumptions that the minimum differentials remain essentially unchanged. Effects of changing the differentials are discussed in a subsequent section of this report.

In making decisions about dairy programs, one of the first steps is to identify the objectives to be sought through Government intervention. These generally involve overcoming perceived deficiencies in market outcomes such as price and output variability or inadequate incomes for farmers. Full agreement on objectives is not generally expected. Moveover, each possible program has secondary effects important to some people, but not to others. A wide range of program effects are, therefore, considered in this study. These relate to objectives that have been set out in legislation, economic efficiency including stability and progressiveness, income distribution, farm and market structure, and other indicators of program performance. In assessing these broad program effects, we quantified specific impacts on production, prices, Government costs, cow numbers, and other variables to the extent possible. More detailed quantitative results providing comparisons of likely outcomes for specific programs are presented in supporting studies (Salathe, 1984 and Novakovic, et al. 1984).

Basic tools available to Government for intervening in the dairy industry, or any industry, include: subsidization; taxation; purchase, storage, and resale or disposal; and administrative control of price or quantity. All existing or proposed programs apply one or a combination of these tools to the domestic industry or to foreign trade. Purchase and disposal, import controls, and administered pricing have been the main forms of intervention in the U.S. dairy industry.

Trade Policy Considerations

This analysis focuses upon domestic dairy programs, especially price supports and marketing orders. However, effectiveness of these programs depends critically upon foreign trade policies and programs. Without import controls, price supports through a purchase program would be unworkable because the United States would be attempting to hold up the world price of dairy products. On the opposite side, export subsidies might substitute for some of the domestic programs as means of supporting prices.

Decisions about dairy product trade policy have strong repercussions for trade in other commodities. For example, any program to subsidize U.S. dairy exports might lead to countermeasures by the European Economic Community. World prices for dairy products would likely be driven down. Barriers to other U.S. products imported by the European Economic Community might be raised. Thus, the ultimate costs and effects of subsidizing dairy exports are highly uncertain. To analyze these multicommodity international trade implications is beyond the scope of this study. Except where noted, the discussion which follows is based on the assumption that U.S. imports of dairy products will continue to be limited to between 2 and 3 billion pounds milk equivalent annually and that exports will remain near historic levels.

Eliminating Programs

The most direct way to avoid the high Government costs and other objections to Federal dairy programs would be to simply eliminate the programs. Either the support program, the marketing order program, or both might be terminated. Disruption of the industry would be lessened if this were done gradually, perhaps

by systematically lowering supports or Class I differentials until they were no longer effective.[1/]

Eliminating the support program is complicated by the need to deal with existing CCC stocks of manufactured dairy products. Total stocks in late 1983 exceeded normal commercial stocks by about 15 billion pounds or approximately 12 percent of utilization. If supports were terminated suddenly and all of these stocks released to the market, prices for manufactured products would be driven well below longrun market clearing levels, possibly for several years. This could force many producers out of dairying and eventually require considerable rebuilding of herds. This type of disruption would be reduced by keeping existing Government stocks at least partly isolated from the market and either releasing them gradually or disposing of them through noncommercial channels.

Even if CCC stocks remained isolated from the commercial market, termination of supports would result in substantial lowering of milk prices. Indications are that real prices would need to be 15-20 percent below 1983 levels (about $11.00 per hundredweight for all milk in 1983 dollars) over a period of several years to balance production with commercial use plus desired levels of Government donations.[2/] The price impact would probably be greater than this for a few years due to lags in cutting back production. Producers would undergo considerable financial stress, particularly those with high debt-asset ratios. Some would go out of business with some of their cows and facilities being taken over by financially more secure producers.

Impacts of eliminating supports would be greatest in those regions with low fluid utilization, particularly the Lake States. Pressures would develop to increase Class I differentials to maintain incomes for producers supplying fluid outlets. Milk prices would become more variable from year to year and within the year. A cyclical production pattern would likely emerge, corresponding to hog and cattle cycles. Nonfat dry milk prices and production would be sharply cut. Production would increase and prices would decline for cheese and products not purchased by CCC under the existing program.

Sudden elimination of Federal marketing orders would introduce much uncertainty into milk marketing. Marketing patterns would change. Short-term adjustment problems could be severe as handlers and manufacturers compete for market shares. The probabilities of below-cost pricing and other competitive abuses along with increased financial failure in fluid distribution and manufacturing would be high.

Experiences with the discontinuance of the Chicago order in 1966-68 and the Mississippi order in 1973-76 suggest that instabilities similar to the pre-Federal order period of the thirties tend to reappear when orders are terminated.[3/] Cooperatives would initially attempt to maintain the existing Class I price structure.

1/ Under current law, import quotas could not be continued without a support program. Without quotas or other import protection, imports would displace much of the domestic dairy manufacturing industry.

2/ Likely impacts of sharply reduced price support levels are described in more detail in Salathe, 1984.

3/ For a review of the Chicago and Mississippi experiences, see Dobson and Buxton, pp. 23-27.

If total milk supplies were roughly in balance, these attempts would be more likely to succeed than if supplies were excessive.

Production and prices at all levels of the marketing system would be more variable. Milk costs among fluid handlers would vary, depending on their source of supply. Milk prices to farmers would vary depending on their location relative to consumption centers, the handlers to whom they sold, and competitive conditions. Producers located on the fringe of fluid market areas would encounter especially volatile prices and more uncertain market outlets.

Market access for producers would be more of a problem, depending on cooperatives' ability to retain their present role in milk assembly. There would be strong incentives for handlers to contract with close-in producers for regular supplies, attempting to rely on cooperatives for residual needs. Some farmers might lose their markets and be forced out of dairying. Overall balancing costs might be higher because of diminished ability to exploit scale economies, or lower because of enhanced ability to balance with storable fluid constituents.

The ultimate effect of eliminating administered pricing on the level of fluid milk prices to consumers is uncertain, depending on, among other things: the acceptibility of fluid milk made from concentrates; the amount by which present Class I prices are not cost justified; how much balancing costs are changed by eliminating orders; and the ability of cooperatives to successfully bargain for prices in the absence of orders. Impacts would be generally greater where Class I differentials have been large. Production would tend to shift to low cost-of-production regions. The high fluid prices in the Southeast would probably be eroded by the introduction of milk reconstituted from ingredients produced in northern production areas.

In the absence of Federal milk marketing orders, other institutions would evolve to partly take their place. In some cases, contracting for supplies of fluid or manufacturing milk for periods of a year or longer could become an important means to provide price and outlet or supply certainty for farmers and processors. More cooperative integration into bottling and joint cooperative-processor ventures could be expected. New State marketing orders could be introduced, but their effectiveness would be limited because many of the markets covered by Federal orders extend into more than one State.

Price Support Alternatives

Extension and modification of the price support program will receive much consideration by policymakers during the remainder of the eighties. An advantage of the price support approach is the price assurance that it provides producers, enabling them to borrow money, plan ahead, and invest in productive cows and cost reducing facilities. A serious problem with price supports is that the support level is sometimes set too high, leading to wasteful surpluses and high Government costs for purchase and disposal.

More difficulties arise in applying price supports to milk than to the major crops because of milk's perishability and bulkiness. Since fresh fluid milk cannot be stored, its price cannot be supported directly. Thus, any economic distortions from supporting prices are concentrated in the manufactured products. Moreover, supplementary programs, such as the minimum pricing provisions of

marketing orders, are needed to extend price protection to producers who sell to the fluid market.

Existing and proposed dairy support programs are all based on a price standard or norm. The price standard for dairy supports was stated in terms of parity from 1949 to September 1980 and has since been defined temporarily in dollars and cents per hundredweight. Use of a price standard is somewhat arbitrary. Level and variability of output and farmers' incomes are basically more important than the level and variability of price itself. And, a stable price for milk does not necessarily guarantee a stable income for dairy farmers due to fluctuations in production costs. Nevertheless, supporting price has been much more acceptable and workable than controlling output or supporting income directly.

Two major issues must be resolved in extending price supports: the general level of support and the mechanism or index to be used for making year-to-year or shorter term adjustments in the level. Congress has generally retained a large direct role in setting the general level of price supports. But, because of the large amount of detailed economic information that needs to be considered, the legislative process is not well suited for making short-term adjustments in the support level. The parity standard has proven to be less than satisfactory for reasons to be discussed subsequently. This calls for pressing the search for an improved pricing standard if any type of price support program is to be retained.

Support Level

The least ambiguous starting point for discussing the level of price support is the market-clearing price. The market-clearing price is defined here as the price, which in the absence of monopoly or supply control and on average over a period of years, would eliminate surpluses, bringing forth production equaling commercial utilization plus desired Government donations.[1/] The market-clearing price depends upon input prices, particularly prices for feed and, to a lesser extent, general economic conditions.

With projected levels of feed prices, indications are that the market-clearing price for the remainder of the eighties is 15-20 percent lower in real terms than 1983 prices.[2/] If the support price is maintained above this level, some type of surplus disposal program or supply control program will be required.

Support Price Adjustment Mechanism

Once the general level of price support is determined, the matter of making year-to-year adjustments remains. The adjustment process can be divided into two periods: the initial transition from current support levels to the desired level and the subsequent adjustment to changing economic conditions such as increasing cost of inputs.

1/ Price stabilization by Government can sometimes be justified on efficiency grounds if private trading is hampered by imperfect information or imperfect markets for spreading risks. If Government intervention is to contribute to overall economic efficiency, the support price generally must not exceed the expected market-clearing price.

2/ Projected outcomes for several different levels of support are provided by Salathe, 1984.

Adjustment problems for producers would probably be eased by making the transition to a new lower support level gradually, say by lowering the support price by $0.50 or $1.00 per year. The real support price can be expected to decline relative to the nominal support price due to inflation by about $0.50 per hundredweight or more per year for the next several years.

Once transition to the desired support level is complete, the question of adjusting the level year-by-year for changes in costs, productivity, and demand arises. Inflation will make the support program ineffective after a few years if the support level is not adjusted. Several approaches bear consideration for making year-to-year adjustments in the price support level. First is the use of an index such as the parity index or the Consumer Price Index. Second is a productivity adjustment to take into account increased output per unit of input. Third is a feedback mechanism that reduces supports when supplies become excessive and increases supports when supplies are short.

Changes that the support price adjustment mechanism needs to reflect include changes in input prices, changes in output per unit of input, and shifts in demand. The current parity formula is deficient in dealing with all three of these changes. It does not give enough weight to changes in feed costs in calculating prices paid for inputs and the mechanism for adjusting for changes in productivity and shifts in demand introduces spurious movements into the resulting parity price.

One of the primary movers in the parity calculation is the index of prices paid by all farmers for inputs used in production. The weights in this index are average purchases of inputs by all farmers, without regard to the products produced. This means that the index does not move one-to-one with the cost of items purchased by dairy farmers. For example, feed has a weight of about 20 percent in the prices paid index but amounts to about 50 percent (including pasture and roughage) of dairy farm costs. Also, the prices paid index includes items not used by dairy farmers (feeder livestock and baby chicks, for example).

Milk production can be very profitable or unprofitable at any particular percentage of parity, depending on many items, the most important of which is feed (table 15). The higher the parity index relative to feed costs (last column), the more profitable dairy farming is at a given percentage of parity. These figures show why a high proportion of dairy farmers lost money in 1974, even though milk prices were over 80 percent of parity and why milk production was profitable and increased sharply in 1978-82.

The other major element in the parity index for milk is the average price of milk relative to all farm products over the preceding 10 years. This feature was introduced by the Agricultural Act of 1949 in an effort to "modernize" parity. Its longrun effect has been to raise the parity price of milk and meats relative to crops, a change at least partly justified by the relatively greater productivity gains in crop production. However, use of the 10-year averages of prices received tends to build-in price effects of programs operating over the last decade. Moreover, it can introduce spurious movements in the parity price. For example, a decline in the 10-year average price for crops will raise the adjusted base price for milk. This could in turn raise the parity price for milk even if the prices paid index declined.

Table 15--Relationship between the parity index and the cost of dairy feed

Year	Parity index 1/	Dairy concentrate ration cost 2/	Ratio, col. 1 - col. 2
	1910-14=100	Dollars/cwt.	
1960	300	2.92	102.7
1961	302	2.92	103.4
1962	307	2.95	104.1
1963	312	3.04	102.6
1964	313	3.03	103.3
1965	322	3.03	106.3
1966	335	3.15	106.3
1967	341	3.22	105.9
1968	349	3.10	112.6
1969	366	3.15	116.2
1970	382	3.28	116.5
1971	400	3.44	116.3
1972	425	3.52	120.7
1973	491	4.88	100.6
1974	558	6.23	89.6
1975	613	6.25	98.1
1976	653	6.31	103.5
1977	689	6.20	111.1
1978	745	6.08	122.5
1979	848	6.68	126.9
1980	948	7.42	127.8
1981	1035	8.05	128.6
1982	1071	7.52	142.4

1/ Index of prices paid by farmers for commodities and services, interest, taxes, and wage rates.
2/ Value per 100 pounds of grain and concentrates fed to milk cows.

A further element in the computation of parity prices for milk is that changes in butterfat content are dealt with in a very indirect fashion, even though milk has been priced explicitly in terms of butterfat content for many years. Butterfat content of milk sold wholesale (to plants and dealers) is now around 3.65 percent compared to about 3.92 to 4.0 percent in the 1910-14 base period for parity price calculations.

One alternative to parity is a cost-of-production standard. If kept up-to-date, it would take into account changes in productivity as well as changes in input costs, but not changes in demand. Maintaining up-to-date estimates of production

costs requires expensive surveys. Cost of production is difficult to compute and depends on many assumptions made by the analysts. Average cost of production is the measure used, but it masks a wide divergence among dairy farmers.

A much less costly means of constructing a cost indicator specific to dairying is to use the prices developed for the prices paid index used in the calculation of parity, but weight them according to inputs used in milk production. An example showing how one such index would have performed in recent years appears in table 16.

A price support index that tracked milk production costs more closely would lead to surpluses and shortages less frequently than the current parity formula. However, any formula is subject to errors or bias which can eventually lead to problems if not corrected. Moreover, parity-type indexes respond to shifts in productivity and demand slowly and imperfectly, at best. This suggests adjusting for increases in productivity directly, possibly using an index such as production per cow.[1/]

Another approach, which deals with shifts in demand and shifts in supply at the same time, is to build into the support formula a feedback mechanism that lowers supports as Government purchases increase, or raises supports as Government purchases decline. For example, the support price might be lowered whenever net removals exceed 4 billion pounds and raised whenever they are less then 2.5 billion pounds.[2/] If properly designed, such a formula could provide considerable stability while leading prices toward their longrun equilibrium levels. The key would be to make the support price response to changes in Government purchases large enough to dampen cycles in production but not so large as to cause sharp reversals.

Supply Control Alternatives

Supply control involves use of special incentives to induce farmers to produce or market less than they would in response to price alone. Examples include payments to reduce marketings below a base level or subsidies for culling cows. Supply control can be used to raise farmers' incomes above levels that would otherwise prevail, much as a monopolist would raise the price by limiting output. Supporters of supply control for milk do not generally propose reducing marketings to the level that would maximize profits for the industry.

A supply control program could conceivably be implemented alone, but supply control is most often considered as a supplement to a price support program. As such, it provides a way to limit surpluses. More generally, supply control offers possibilities for increasing farmers' incomes at less cost to Government than price supports and Government purchases. Income is transferred directly from consumers to producers through higher prices for milk. Shortrun income transfers may be achieved at relatively little net loss to society as a whole if administrative problems can be overcome. Supply control may contribute to

1/ A dairy-specific prices paid index combined with an index of average milk production per cow is used as a price standard in one of the scenarios presented in Salathe, 1984.

2/ Projected effects of using such a rule are presented in Salathe, 1984.

Table 16--Composition of a dairy-specific prices paid index, 1976-82

Component	Weight	Annual average prices paid index						
		1976	1977	1978	1979	1980	1981	1982
	Pct.	1977=100						
Feed	35	103	100	98	110	123	134	122
Feeder livestock	5	97	100	140	185	177	164	164
Seed	2	92	100	105	110	118	138	141
Fertilizer	5	102	100	100	108	134	144	144
Agr. chemicals	1	111	100	94	96	102	111	119
Fuels and energy	3	93	100	105	137	188	213	211
Farm and motor supplies	4	100	100	104	115	134	147	153
Other machinery	8	92	100	108	119	132	146	160
Bldg. and fencing	10	94	100	108	118	128	134	135
Wage rates	6	93	100	107	117	127	136	141
Interest	6	87	100	118	141	168	195	233
Taxes	3	94	100	100	107	117	124	131
Farm services and cash rent	7	92	100	107	117	127	137	143
Miscellaneous	5	94	100	107	120	137	151	154
Prices paid index for dairy	100	97	100	105	119	133	144	145
Parity index	--	95	100	108	123	138	150	155

-- = Not applicable.

stability since under most supply control schemes the incentives for each farmer to market at or near the fixed quota level are strong.

Incentives to Reduce Marketings

Most proposals for controlling milk supply would set a marketing quota or base for each producer and provide a financial incentive for staying within the quota or reducing marketings below the base. One possibility is to offer a specified payment for each hundredweight that sales are reduced below the base. Alternatively, a lump sum payment might be offered for staying within a quota, which might be, say, 90 percent of the farm's historical base. Another possibility is to somehow assure that the producer is paid less for excess milk sold.

To be effective, a program of incentives to limit marketings must reduce the return for excess milk to less than the farmer's marginal or out-of-pocket costs. This generally means that the financial incentive for each hundredweight that marketings are reduced must exceed the return that would be earned in producing milk by the idled fixed inputs, such as milking facilities and family labor. For periods of a year or two, more inputs are essentially fixed or locked into dairy production than for longer periods. Hence, incentives required to get quick reductions in output are relatively high.

In establishing an effective quota or base program, the Government transfers future income from consumers to the quota holders. These expected income flows are capitalized into the value of the quotas. Since quotas become valuable property, rules must be established for transferring them from farm to farm. Special provisions for new entrants are needed unless entry is to become very difficult for young farmers. Making quotas transferrable between farms would allow lower cost producers to increase output leading to greater production efficiency and more rapidly declining farm numbers than nontransferrable quotas.

Control of marketings requires detailed regulation of individual producers. First, a base must be established for each farm using historical records. Compliance with quota provisions must be closely monitored since there would be strong incentives to cheat. Many controversies would arise in assigning quotas and monitoring compliance.1/ Consequently, the administrative costs of effective quota programs would be substantial.

With incentives to stay within quotas very strong and with incentives limited to a given percentage of production on each farm, supply control programs can be used to spread production cutbacks more evenly among producers than would occur by simply lowering the support price. This tends to force many program participants to operate at less than their least-cost levels of output. Low-cost producers cannot profitably expand and displace high-cost producers. Productivity is, consequently, reduced in the long run.

One of the most direct ways of reducing marketings is to offer each farmer a fixed sum per hundredweight that marketings are reduced below that farmer's base. Producers with high marginal costs would be attracted to the program; those with lower marginal costs might continue to produce and market at or above their bases. The payments could be limited to a given percentage of the milk on each farm or extended to the entire output of the farm. Limiting the percentage of paid reduction by farm would tend to maintain the number of farms and reduce output per farm. Allowing participants to be paid for completely dropping out of production would reduce total production at less cost to Government and leave the lower cost farms in operation. But, such payments would reduce numbers of producers.

Instead of paying for output reduction by unit, lump sum incentives could be used. The 1982 Budget Reconciliation Act contained such a provision. Producers would receive $0.50 per hundredweight refund on their entire output if they cut production by a specified percentage; otherwise, they would receive nothing. Under a lump sum incentive program, producers would divide themselves into two distinct groups: those meeting the required percentage reduction in output and the nonparticipants.

Incentives to reduce marketings can be made partly or wholly self financing by deductions or assessments on producers' remaining output. For example, a $9.00 payment per hundredweight for reducing marketings by 10 percent could be financed by a $1.00 deduction per hundredweight on the remaining 90 percent of base marketings. This would provide a strong incentive for each producer to participate, without regard to production costs. If, instead, the payment were $4.50 for

1/ When California introduced a base plan in 1969, about 800 cases out of 2,400 producers came before a peer board.

reducing marketings with a $0.50-deduction, the program would be self financing, but fewer producers would participate. By adjusting the deduction, the rate of payment for reducing production, and the percentage of paid reduction allowed, the distribution of benefits and effects on production efficiency could be controlled along with Government costs.

A somewhat different kind of incentive for limiting marketings would be to lower the price to producers for output in excess of their bases. This can be called two-tier pricing with the higher price applying to base production and the lower price to excess production. Two-tier pricing might be implemented by charging an assessment on production in excess of the base and using funds collected to finance disposal operations or for other purposes.

Incentives for Reducing Inputs

Supply control incentives could be directed at inputs, such as cows and milking facilities, instead of milk outputs. Several European countries have used cow culling payments at various times. Australia instituted a rural adjustment program which, among other things, converted many dairy operations to beef operations during the early seventies. In some cases, paying to remove inputs may be administratively easier than paying to limit output.

Paying a subsidy for each dairy cow sent to slaughter would be one of the simplest, but least effective, forms of milk production control. Such a culling subsidy could be administered based upon bills of sale to slaughter plants; monitoring of individual farm records of cow numbers or milk production would be unnecessary. Many of the payments would be for cows that would have been culled anyway, but the subsidy would tend to increase culling and reduce herd size for a year or two until the number of replacement heifers could be increased. When implemented in conjunction with a lowering of price supports, such payments could partly compensate producers for lost cash flow and decline in value of their cows and dairy facilities.

Payments must be limited to cows that would not otherwise be culled to effectively reduce production through a cow culling program. This might be accomplished through a system for certifying that the culled cows were productive milkers, but any such system would be subject to abuses. A more effective method of reducing production would be to make payments on the basis of demonstrated reductions in numbers of cows milked. However, the data available, particularly through the Federal marketing order system, would allow reductions in milk sales per farm to be monitored more effectively than reductions in cow numbers. Moreover, basing payments on reductions in milk marketings rather than reductions in cow numbers would avoid stimulating increased output per cow. Thus, milk supply could be controlled with much less slippage and fewer administrative costs by tying incentives to milk sales rather than to cow numbers.

Direct Payments or Assessments

Direct payments or assessments provide means to transfer income from Government to producers or from producers to Government. A direct payment program can take the form of a deficiency payment, making up to farmers the difference between the market price and a target price set by Government. Such programs have been used for crops. Direct payments could be made on all milk produced or only on a base quantity of milk.

If direct payments were based upon current production, costs to Government would be much greater than for a purchase and disposal program providing the same level of price enhancement. However, consumers would be made relatively better off by having lower cost milk.

Direct payments based upon historical milk output or some other qualification criteria would transfer income from the general public to producers with minimal distortion of milk production and use. Such payments would do little or nothing to stabilize prices and output. Moreover, they would introduce the same type of problems in setting and monitoring quotas or bases as would the marketing quota programs previously discussed.

An assessment based on milk production is essentially equivalent to an excise tax. Assessments have been used to discourage production and raise funds to help cover costs of price supports. They might also be used to finance incentive payments for reducing marketings.

Both direct payments and assessments require information on individual farm marketings, so the administrative burden would be considerable. However, the Federal marketing order program provides much of the information needed for milk covered by Federal orders.

A quantitative comparison of the major effects of selected types of general support programs for dairy is provided in Appendix A.

Marketing Order Alternatives

Alternatives for changing marketing orders while leaving the order system intact are considered in this section. Some would involve substantial changes in USDA policies or new legislation. Motives for changing Federal marketing order programs arise from various concerns about present program operations. These include concerns about burdens of regulation, possible price discrimination, inefficiencies, lack of incentives to move milk into fluid uses, possible imbalance in the treatment of cooperatives and proprietary firms, and barriers to the adoption of changed technology, particularly reconstituted milk. If milk surpluses are eliminated, some changes in the order system may be needed to help assure supplies to fluid deficit areas. Moreover, continuing changes in the industry require frequent updating of individual orders; they may call for occasional changes in the entire order system.

The following discussion looks at the effects of eliminating the pricing provisions of orders entirely and then the possibilities of changing the minimum prices charged processors. Possibilities for changing the rules for allocating revenues to producers are also treated.

Eliminating Administered Pricing

Pricing provisions of Federal milk marketing orders might be eliminated while retaining testing, auditing, and price reporting functions. This could be accomplished by lowering minimum price differentials or allowing them to erode with inflation. Completely eliminating the pricing provisions would have effects similar to eliminating orders, which are discussed on pages 61-62, except that some of the protection that orders afford producers would be preserved.

One proposal would eliminate minimum prices, but use marketing order machinery to maintain class price differentials (Luke and Gruebele). No blend price would be set. The Class I differential would be collected from fluid handlers for each hundredweight of milk going into fluid use. These collections would be pooled and distributed to all handlers in proportion to the amount of producer's milk each buys. Actual prices would be negotiated between producers and processors, much the same as if no order existed. Problems of setting appropriate differentials would be the same under this proposal as under current order provisions.

In the absence of minimum prices, order machinery might be adapted to enforce contracts negotiated between producers and processors without any reallocation of revenues through pooling. This would leave prices and price differentials to be determined by market forces, but reduce the likelihood of abuses and provide a degree of price certainty for both sellers and buyers. As an aid in market pricing, the order might set suggested prices to be used as a point of departure in price negotiations, but not enforced as minimum prices.

Replacing Classified Pricing With Cost-Based Administered Pricing

Possibilities for developing an alternative method for administering prices deserve consideration in view of the need for a degree of price certainty and stability and the problems in pricing milk by use class. Fully efficient pricing would require prices to both processors and producers to reflect marginal values and costs of producing the milk and its associated services. Pricing by use class could meet this requirement on the processor side if all fluid distributors required essentially the same services while manufacturers required a different set of services and the Class I differential equaled the extra cost of the services required by the fluid distributors. Alternatively, processors could be charged for the specific services they receive with the milk without regard to how the milk is used. This would generally result in more efficient pricing if the cost of the services could be estimated.

Some fluid distributors prefer to rely almost entirely on producer cooperatives for balancing services while others are in a position to do some of their own balancing. The pricing system could accomodate both. For example, there could be one price for Grade A milk delivered to the processor 5 days per week with a daily variation in quantity of ±25 percent at the buyer's discretion. A lower price could apply if the buyer is willing to take essentially uniform delivery 7 days a week, and a still lower price if the buyer is willing to let the seller determine the daily or monthly variations in quantity, within prescribed limits. Numerous combinations of services including transportation differences could be priced. Each processor could choose the combinations desired.

Monitoring the services that each processor receives would be more difficult than monitoring the processor's use of milk. The task might be eased by employing a system of written contracts between producers or their cooperatives and processors that the administrative agency would help enforce. For fully efficient pricing, payments to producers would need to be set in a similar fashion.

A fully cost-based administered pricing system would be very complex because of the wide range in conditions and marketing services performed. In practice, only part of the services could be priced administratively; the charge for others would be left to be negotiated between sellers and buyers as it is now.

In any case, however, a substantial administrative effort would be required in keeping the cost estimates timely and monitoring compliance.

If it could be implemented, a cost-based administered pricing system would encourage each supplier and processor to perform those services for which it had a comparative advantage. It would reduce incentives for more reserves than needed and uneconomic milk movements to qualify for the pool. Reconstitution of milk would emerge where it was cost efficient.

Feasibility of operating an administered pricing system for milk based directly on cost of services performed remains in doubt. Further study would be needed before initiating such a change.

Changing Inter-Order Class I Price Differentials

Procedures used for setting Class I price differentials between orders can have profound effects on regional milk production and shipment patterns. This has consequently been a topic of considerable debate. Some point out that the Class I differentials are woefully out of line with transportation costs, and argue that the differentials should be increased, thereby raising Class I prices in other areas relative to the base area in the Upper Midwest. Others contend that existing Class I differentials, and perhaps any Class I differential, are evidence of price discrimination and that Class I prices should be reduced. In the following discussion, alternative methods for spatially structuring Class I prices are examined.

At this time, minimum Federal order Class I prices approximately correspond to the Class I price in the Upper Midwest (Eau Claire, Wis.) plus a location differential to reflect the cost of transporting bulk milk from that region or base point. With a few exceptions, Class I differentials have not been changed across orders since 1968. The actual location differential is about $0.15 per hundredweight per 100 miles, which in 1983 was less than half the actual shipping cost. Over-order Class I premiums reflect at least in part the cost of transportation not covered by the order minimum prices.

The Class I differential in each market area partly covers three types of costs associated with the fluid market: the additional cost of producing fluid grade as compared to manufacturing grade milk; costs of providing balancing services to the fluid market; and, for deficit regions, costs of hauling milk from a fluid surplus region. In areas that produce a surplus of fluid milk, only the first two costs enter. Thus, the differential for the Upper Midwest presumably should cover balancing costs plus extra costs for Grade A production. In most other areas, balancing costs and perhaps some of the hauling costs are partly covered by over-order charges.

The Class I price surface could be changed by changing the base area differential or the location differential, by redefining the base area, or by some combination of these changes. Appendix B presents results from a quantitative analysis of the effects of such changes (Novakovic et al. 1984).

If fluid deficit areas are to be supplied milk from surplus areas, the price difference between the two must equal or exceed the cost of transportation. Since current Class I differentials are generally less than transportation costs, little incentive exists within the order system per se for interregional movements. This

suggests that the differentials be increased for those areas that actually receive milk from other areas.

At $1.12 per hundredweight, the Class I differential in the Upper Midwest appears higher than needed to cover additional Grade A production costs and balancing costs. Lowering this differential without changing the location differentials would lower the entire structure of Class I prices. Lowering it in combination with an increase in the location differentials for fluid milk deficit areas would appear to make prices reflect costs more closely.

Increasing location differentials would generally reduce milk prices and production in the Upper Midwest and nearby areas, and increase prices and production in more distant regions. For example, increasing the location differential from approximately $0.14 to $0.325 per hundredweight per 100 miles to approximately equal hauling costs, while lowering the base area differential to $0.40 per hundredweight, would tend to lower milk prices and marketings in the Lake States by about 2 percent while increasing prices and marketings in the Southeast by about 3 percent and 2 percent respectively (See column headed BP1 in App. tables 7 and 8).

The "ideal" set of Class I differentials would take into account the fact that other regions besides the Upper Midwest are more than self-sufficient in fluid milk production and capable of shipping milk to deficit areas.[1/] This ideal could be approached by employing one or more additional base points in other areas that produce more milk than needed for fluid use. For example, a base point in the Northeast would lower the differential in that area and provide incentives to ship fluid milk from there to nearby areas in the Southeast. A further step toward a more nearly ideal price surface would be to introduce additional base points or a base zone extending from the Upper Midwest to the Northeast.

Adding a basing point in the Northeast or a base zone extending from the Upper Midwest to the Northeast would generally tend to raise milk prices and production in the Lake States and lower prices and production in the Northeast and Southeast. For example, a switch to a base zone extending across the Northern States, in combination with a set of location differentials that approximately equal transportation costs, would increase prices about 2 percent in the Lake States and lower prices about 4 percent in the Northeast and about 1 percent in the Southeast (See column headed BP3 in App. table 7).

Removing the obstacles to reconstituting milk imposed by marketing orders would strongly affect order pricing and particularly location differentials. A move in this direction would imply lower location differentials giving effects generally opposite to those described for increased location differentials. These are also illustrated in Appendix B.

1/ The "ideal" set of Class I differentials is defined here as that set of differentials among all possible sets of use class differentials that maximizes efficiency or net economic product. Among other things, this implies that the price difference between any two regions will equal the cost of shipping from one to the other if movement occurs, but generally be less than the cost of shipment if there is no movement. This suggests that the ideal set of differentials would probably change seasonally and from year-to-year as shipment patterns change.

The changes in base areas and differentials analyzed in Appendix B and considered here represent only approximations to a fully efficient set of class price differentials. To determine a fully efficient set of differentials would require more information and a more comprehensive approach. For example, more information about balancing costs is needed to determine appropriate differentials in the base zone. Location differentials may be needed for manufacturing milk. Since transportation costs need only be covered by price differences when milk is actually moving, seasonally changing differentials may be desirable. These and other considerations imply that further analysis is needed to develop a more efficient scheme for setting administered prices.

Reconstituted Milk

Closely related to the matter of inter-order price differentials is the issue of pricing ingredients for reconstituted milk. Current compensation and allocation provisions of marketing orders impose strong economic disincentives to the commercial reconstitution of milk. Consumers are, in effect, denied access to a lower cost commercially made product with taste and nutrition characteristics similar to fresh milk. Since economic progress and growth depend upon application of new technology, any law or regulation interfering with the use of a particular type of product needs to be reviewed and possibly changed.

In deciding whether to change the rules regarding reconstitution, the potential gains in economic efficiency and from making lower cost milk available to consumers must be weighed against the effects on farmers and society of weakening or eliminating classified pricing. Regional differences in the impacts on producers are significant. Producers in low cost production areas might benefit from removing barriers to reconstituted milk while producers in high cost areas would be hurt. Most gains from reconstitution would go to fluid consumers residing in areas where milk production costs are high. Reconstitution may allow part of their consumption to be supplied by milk produced at lower cost in other areas or at other times during the year.

Fairness to consumers who prefer fresh fluid milk to partially or completely reconstituted milk requires that the two be readily distinguishable by label. To have competitive prices, many retailers would sell reconstituted milk products at the minimum legal solids content, although some might feature products with higher solid levels at premium prices. Thus, in most markets, average solids content would likely be nearer the minimum than it is now.

Commercial reconstitution would enable economies in milk marketing to be achieved through storage and lower cost transportation under certain conditions. Costs of providing reserves for the fluid market could possibly be reduced since ingredients for reconstituted milk can be stored much longer than fresh milk. They can be shipped at lower cost since water, which accounts for 87 percent of the weight of fluid milk, is eliminated. Counterbalancing these potential economies are the costs of concentration and reconstitution.

Changes in marketing order provisions that would make price differences reflect costs more closely would tend to reduce the disincentives to reconstitution. For example, if an orderly market could be achieved without regulation, the amount of milk reconstituted for consumption in each area presumably would depend on relative costs. Similarly, under a fully cost-based administered pricing system,

reconstitution would proceed as far as is economically efficient. These types of broad changes are discussed on pages 71-72.

Two possibilities for lowering marketing order disincentives to reconstitution are:

Charging the manufacturing price for ingredients going into reconstituted milk.

Continuing to charge the Class I price for ingredients for reconstituted milk, but lower the Class I location differentials to equal the cost of transporting ingredients.

The first alternative would make reconstituted milk considerably cheaper than fresh milk in areas with high Class I differentials. Since reconstituted milk is a close substitute for fresh milk, a large share of the market would switch to the reconstituted product in high production cost areas. Class I use in these areas would decline, blend prices would decline, and production would eventually decline. Pressures would arise to lower Class I differentials so that fresh milk could compete more closely in price with reconstituted milk.

In low cost production areas, fresh milk would continue to be the least cost method of supplying the fluid market since concentration and reconstitution costs would be greater than Class I differentials. But, there is a possibility that in any region handlers might circumvent the classified pricing system through phantom reconstitution. As an example, consider a handler with equal Class I and manufacturing class sales who can manufacture products with either fresh milk or dry components. The handler could avoid Class I payments and reconstitution costs by reporting all fresh milk purchases as manufacturing use and all fluid milk sales as reconstituted when, in fact, fresh milk was being sold as fluid. Preventing this type of false labeling and reporting would be very difficult since existing tests cannot accurately distinguish between fresh and reconstituted milk. Such phantom reconstitution could virtually eliminate Class I sales, making classified pricing untenable. Milk prices must reflect to both producers and processors the value or cost of services embodied in the milk to eliminate the incentive for phantom reconstitution. This might be attained through negotiated pricing or through administered pricing based upon the cost of services.

Assuming that phantom reconstitution is avoided, economic studies indicate that reconstituted milk could eventually account for about a third or more of fluid milk consumption if the ingredients were priced as manufacturing ingredients (Federal Register, 1980, and Whipple). Farm prices for milk could decline by as much as 15 percent in Florida and less in other high cost-of-production areas. Farm prices in the Lake States would increase about 1 or 2 percent if prices were not resting on supports. Of course, little or no impact on manufacturing milk prices could be expected so long as Government purchases hold up the price. With more reconstitution, gross farm receipts from milk sales would decline, largely because the milk would be produced in lower cost-of-production areas.

The second alternative is intermediate between the first alternative and current pricing provisions. Under it, consumers of reconstituted milk would avoid paying the cost of fluid milk transportation, but they would still be paying for balancing

services they do not use, as reflected in the Class I differential in the shipping area. Impacts on the industry would be much less severe than for the first alternative. For example, the potential market share for reconstituted milk has been estimated at 12 percent (Federal Register, 1980, p. 75987, App. table 1). Some regional effects of this type of change, in combination with other changes, are illustrated in Appendex B of this report.

Lowering disincentives for reconstitution of milk would generally narrow the price range for milk going into different uses in each area and reduce geographical price differences. Milk production would decrease in high cost-of-production areas. Adjustments would be painful in high cost areas, such as Florida, if the change were made suddenly. Demand for milk to make ingredients for reconstitution would increase in low cost-of-production areas. Effects on farmer prices and incomes incomes in low cost areas would be small as long as prices rested on supports. In the absence of price supports or with ineffective supports, low cost producers would gain. Gross returns to milk producers would decline; the effect on net farm income is not known, but would likely be small. Fluid milk consumers would pay lower prices on average while manufactured milk consumers would pay slightly higher prices. Overall gains in economic efficiency would be modest.[1/]

Changes in Intra-Order Transportation Allowances

Milk prices charged to handlers and blend prices paid to producers within orders are based upon zones centered on the primary fluid market in each order. In many orders, the zone boundaries and the hauling differentials between zones have grown seriously out-of-date. In Chicago, for example, problems exist in getting milk to move to fluid plants in the city and its northern suburbs. Realignment of zones and increased zone differentials might help this movement. Intra-order location differentials must be consistent with inter-order differentials to avoid stimulating inefficient milk shipments near the boundaries of orders. This suggests that a mechanism be developed for regular updating of location differentials within orders and between orders. Changes need to take into account not only changes in hauling costs, but also changes in the location of production, processing plants, and milk movements.

Alternative Means of Distributing Pool Revenues

Matching fresh milk supplies with fluid milk processors' needs involves a variety of market balancing operations. Many of these balancing operations, such as shifting milk flows among packaging plants as use varies, are marketwide services. They are mostly performed by large full service cooperatives. Under current Federal order provisions, revenues are distributed by paying everyone in the pool a uniform blend price, subject to adjustments for location and certain direct marketing services, but without regard to who provides the marketwide balancing services. Producers shipping to manufacturing plants which seldom direct milk to the fluid market, and those shipping to fluid plants but not providing balancing services, do not share in the balancing costs. In any case, over-order payments generally are needed to draw forth balancing services. Possibilities for changing

1/ Based on 1976 data Hammond, et al. estimated social welfare gains of $22 million to $25 million annually for a scenario involving pricing ingredients for reconstitution at manufacturing prices.

order provisions to provide broader sharing of the truly marketwide balancing costs are considered here.

The system would ideally provide incentives to perform market services in the most efficient manner possible. It would also encourage innovation in balancing and avoid encouraging inefficient milk production, transportation, and plant location.

Suppliers of marketwide balancing services could be compensated either by direct payments from pool revenues for specific costs incurred, or by allocating revenues in a manner that approximately corresponds to costs of services provided. Each method has advantages and disadvantages. With adequate enforcement, direct payments (in the form of pool credits) would be made only when services were actually performed. But this can be done only for those costs which can be accurately quantified. Many important balancing costs (management costs of coordinating milk flows, for example) do not meet this condition. This approach would increase the complexity of order administration and enforcement. It would also tend to encourage unnecessary costs. While providing only partial compensation from the pool would lessen such inefficiencies, there would still be incentives to incur costs which provide private benefits but work to the detriment of the market as a whole. Such payments also tend to discourage exploration of potentially cost reducing innovations.

Distribution of revenues according to measures which indirectly reflect services to the fluid market is administratively much simpler, since specific, individual services do not need to be identified. Compensation could be made for services that cannot be accurately quantified. However, ways would be found to qualify for larger payments without providing full services. Such opportunities are almost inevitable with indirect measures. In addition, initial revenue distribution must be somewhat arbitrary and is difficult to adjust as costs change because the distribution is not directly tied to quantifiable costs.

Transportation Credits. Producers' cooperatives have on numerous occasions sought pool credits for specific milk movements. Examples include payments for moving milk from existing surplus pockets to secondary consumption centers and payments for moving surplus milk unusually long distances to manufacturing plants. Unlike location adjustments, which affect prices for both producers and processors, pool credits leave processors' prices unchanged and only redistribute revenues among producers. Thus, they are an appropriate means to compensate a group of producers who provide hauling services that benefit all producers in the order. They are potentially useful as a temporary device for stimulating milk movements to reduce short-term surpluses or shortages.

Transportation credits are not an efficient substitute for a properly aligned price surface since they distort the relationship between prices to processors and prices paid producers. They tend to price milk in the receiving area below its economic value, discouraging production there and stimulating shipments from distant areas at a loss in overall efficiency. Moreover, processors in the receiving area may be given an artificial advantage over processors near the shipping area who get no corresponding payment for moving packaged milk. Such inefficencies would be less if pool credits covered only part of the transportation costs, but they cannot be avoided completely.

Credits for Other Balancing Services. Pool credits could be used to compensate producers' cooperatives for performing certain other marketwide services such as seasonal balancing. Distinguishing between truly marketwide services and those services that benefit only the processor receiving the milk is difficult. For example, shifting milk flows among processors in a market as needs vary is clearly a marketwide service. But adjusting flows for seasonal variations in use at a given plant may be partly an individual service and partly a marketwide service. Moreover, the costs of providing many marketing services are difficult to isolate and quantify.

One of the largest costs of servicing the fluid market and one that is potentially quantifiable is the extra cost that balancing plants incur because they must operate at less than full capacity during periods when milk is being diverted to the fluid milk market.[1/] Enforcement of a balancing plant credit would be difficult. It would be very hard to determine if variations in receipts for manufacturing actually represent variability from the fluid market. For example, plant operators might arrange shifts of milk among plants to heighten apparent variability and total pool credits. They would be tempted to manufacture the surplus, even when other alternatives, such as storage, might result in considerably lower costs. Pool credits would tend to encourage decentralized balancing, which requires greater aggregate balancing capacity and increases a variety of balancing costs.

Although conceptually appealing, giving pool credits for balancing services presents many practical difficulties. Enforcement problems and efficiency losses could outweigh benefits, while complexity of the orders would grow substantially.

Pooling Requirements. Because pool plants pay Class II or III prices for their manufacturing milk while their producers receive the higher blend price, many milk manufacturers can obtain a substantial competitive advantage in attracting producers by qualifying their plants for the pool. In some other cases, a qualified plant can obtain cheaper or higher quality milk for manufacturing. Minimum qualification standards assure that each plant associated with the pool will provide some minimal level of service to the fluid market. Qualification standards are most often stated in terms of shipping requirements which call for the plant to ship specified amounts of milk to the fluid market each year or when called upon by the market administrator.

Properly structured, tighter qualification standards would create greater incentives to service the fluid market as plants competed for pool status. However, this might be a relatively inefficient means of providing milk for Class I use. Qualification standards can force high cost shipments from distant plants when the milk for fluid use might be obtained at lower cost from nearby plants. Secondly, unnecessary movement of milk may be fostered for the sole purpose of qualifying for the pool. The practice of shipping milk to a pool plant for qualification and returning it to its origin for processing represents a glaring inefficiency to even the most casual observer.

Individual Handler Pools. Processors who are not substantially involved with the fluid market have little incentive to be associated with an order when receipts are pooled by individual handlers rather than marketwide. Therefore, pool revenues are not shared with plants and producers who are only nominally a part of

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1/ Methods for estimating these costs are discussed by Ling.

the fluid market. In addition, the average price that a plant can offer for producer milk can be increased by giving up milk for fluid use, without regard to the plant's initial involvement with the fluid market. The resulting competition for fluid sales makes satisfying fluid needs easier. However, individual handler pools distribute revenues according to utilization of milk in fluid products rather than according to services provided to the fluid market. The highest price would be paid by plants with near total fluid utilization. These plants probably provide few, if any, balancing services to the market, while a plant providing most of the balancing services to the market could have a low fluid utilization. A typical fluid processor now serves a few large retailer accounts. Shifting a large chain account to a different plant (or closing a plant) would create large price swings for different groups of producers within a market. Another drawback experienced under orders with individual handler pools in the past was that plants would attract producers when supplies were tight, then drop them when supplies were ample in order to protect utilization rates. Those orders thereby perpetuated one of the disorderly marketing situations they were created to remedy.

Reduced Class III Prices. Reducing the minimum Class III price would allow balancing plants to recover part of the cost of providing the fluid reserve through diminished losses on their manufacturing operations, an indirect form of balancing credits. This would shift revenues from those groups who do not manufacture their share of the reserve to the groups carrying the balancing capacity. However, it also would shift revenue to manufacturing operations which provide minimal balancing services to the fluid market. A regulated manufacturer would incur about the same operating costs as the unregulated counterpart, pay less for raw milk, and receive the same product price. Reducing Class III prices in all markets would ultimately be self defeating, since all plants would become pooled and balancing plants would be on the same competitive footing as they are now. If Class III prices were reduced only in high utilization markets, considerable inefficiency could be created. Increased manufacturing operations in high cost areas would be encouraged, draining away local milk needed for fluid use and necessitating greater shipment of milk to meet fluid needs. Substantial problems can generally be expected any time manufacturing costs are distorted in an attempt to compensate for costs arising from the fluid market.

Two-Tier Pooling Arrangements. Two-tier pooling involves creating two classes of qualified plants so that revenues can be shifted from pool plants primarily providing standby supplies of milk to those regularly supplying the fluid market. A multitude of two-tier pooling arrangements could be devised. All share a common approach and would have some of the same general impacts but specific effects would depend on the particular variant and its implementation. Some of the possible variants include: (1) creating separate tier pools for fluid distributing plants and standby plants, (2) splitting the differential into a portion distributed in a marketwide pool and a portion distributed in individual handler pools, (3) creating a tier pool for fluid distribution plants and individual handler pools for standby plants, and (4) assigning standby plants a location adjustment equal to that at the market fringe. Many of the possible alternatives would require new or clarified legislative authority.

Two-tier pooling would reduce the incentive for plants to maintain minimal association with the pool. In the heavy surplus areas, plants would leave the pool where substantial costs were involved in meeting qualification standards.

Standby plants would find it more difficult to maintain milk supplies unless they provided substantial services to the fluid market.

Such an arrangement would generally enhance the incentive to move milk into fluid use, particularly in high utilization markets and close to consumption centers. Fluid market plants would have a clear advantage in competing for milk producers and would be expected to strive for Class I sales to gain or maintain the status of a fluid market plant. However, some unnecessary movement of milk for qualification as a fluid market plant (analogous to the inefficiencies arising from current qualification standards) would be almost inevitable.

Two-tier pooling would add to the complexity of the orders, although it is possible that even more complex, cooperative pricing structures currently used in a few markets might then be allowed to lapse. Implementation of such a plan would be difficult and divisive. Beyond the inherent difficulties of choosing the best alternative, drafting effective provisions, and defining exactly what constitutes a fluid market plant, some groups of producers within a market would clearly gain from such a plan while others would clearly lose.

Two-tier pooling would shift revenues from producers supplying manufacturing operations to those providing substantial quantities to the fluid market. It cannot differentiate between fluid operations which provide few market services and those carrying a disproportionate share of the balancing cost. Such plans generally increase the incentive to form limited service cooperatives.

Arrangements for two-tier pooling deserve serious consideration, at least for lower utilization markets. Some efficiency gains would be likely and the added incentive to move milk into fluid use would reduce the need for sizable over-order payments. Less reliance on over-order pricing might enhance stability and equity among processors.

There is no simple way to determine the value of, and reward those who provide, the marketing services associated with Class I milk that make it more valuable than milk going into manufacturing. However, there are several possibilities for aligning the class price differentials more closely with costs and for distributing pool revenues more nearly in accord with service provided.

Cooperative Policy Alternatives

Cooperatives are involved in the assembly of most milk going into fluid use in the United States. Cooperatives bargain with handlers for price, balance members' production with processor requirements, and provide numerous other services for producers and processors. Cooperatives are active advocates and representatives for their members in marketing order administrative proceedings and are major beneficiaries of some order provisions. Without marketing orders, the importance of their role in representing members in negotiations with processors would likely increase. But their relative market power positions vis a vis processors would probably deteriorate because of more opportunities for freeriding by nonmembers and splinter groups.

One means to maintain the bargaining strength of dairy cooperatives in the absence of Federal marketing orders would be to institute exclusive agency bargaining. Exclusive agency bargaining, requiring new Federal legislation, would grant

producer organizations the sole right to negotiate terms of trade with processors for all shippers to the market, whether or not they were members of the organizations. Freeriders would thus be eliminated. But cooperatives would, in essence, be granted monopoly power. Both producers and processors would lose the discretion they presently have in dealing with cooperative associations.

Some maintain that dairy cooperatives already possess too much market power and that further checks on the abuse of market power are needed. Indeed, several milk markets are dominated by a single large cooperative. The Department of Justice vigorously pursued cases against the three largest dairy cooperatives in the early seventies. The Department of Agriculture has made little use of Section 2 of the Capper-Volstead Act, which obligates the Secretary of Agriculture to issue a cease and desist order against any agricultural marketing cooperative judged to have unduly enhanced prices through monopolization or restraint of trade. There is no clear evidence that dairy cooperatives are presently abusing market power, and their open membership policies serve as an effective check on cooperatives' ability to limit milk supplies. Whether more aggressive enforcement of Section 2 or other antitrust statutes against dairy cooperatives would be in the public interest is not readily apparent. A thorough examination of cooperative policy is beyond the scope of this study.

Demand-Oriented Programs

Another approach to eliminating surpluses and raising farmers' incomes is to promote increased consumption of dairy products. Proposals for expanding consumption include: (1) substantial increases in dairy promotion and advertising; (2) research in dairy product development and marketing; (3) nutrition education; (4) State or Federal standards for increasing the minimum milk solids content of fluid milk and selected dairy products; (5) new or expanded Federal domestic food programs; and (6) Federal programs for expanding commercial exports or foreign food assistance programs. Most of these proposals would require substantial Federal Government administrative and financial involvement. Some proposals, such as industry wide promotion and advertising and product development financed by a checkoff on sales of milk may be considered industry self-help programs in that the Government would not directly finance the programs.

During periods of substantial Government purchases under the price support program, effective promotion could reduce Government program costs. So long as the Government stands ready to buy manufactured products at high support prices, dairy farmers have little to gain from advertising manufactured dairy products or from other potential demand expansion efforts (Kinnucan, 1983). However, if milk prices are supported at or near market-clearing levels rather than at higher levels, gains from demand expansion would accrue directly to producers. Even with high price supports, returns to dairy farmers might possibly be increased by promotion of fluid milk products if the revenue from the higher blend price received by farmers exceeds the expenditures for advertising.

Dairy Promotion and Advertising

This section focuses on generic advertising and promotion aimed at increasing sales of a product category, such as beverage sales of milk, rather than a firm's own specific brand. The terms "advertising" and "promotion" will be used interchangeably. The numerous dimensions and aspects of advertising/promotion make

it difficult to precisely quantifly and assess effects of these activities on product sales and net returns to producers.

A number of studies have attempted to measure effects of generic advertising. Results generally indicate that milk and dairy product advertising can have a positive effect on sales and can provide producers with an appealing rate of return on investment. Early investigations of the economic impact of fluid milk promotion programs were conducted in the sixties by Clement, Henderson, and Eley, and in the seventies by Thompson and Eiler. Since the passage of the Dairy Promotion Order in May of 1972, New York State dairy farmers have contributed some $4 million annually (about $267 per producer) to promote consumption of dairy products.1/ An important finding of the New York studies is that there are marked intermarket differences in the rates of return from advertising.

The national dairy industry organization for promoting milk and dairy products is the United Dairy Industry Association (UDIA). UDIA and other promotional organizations spend advertising/promotion funds collected under Federal, State, cooperative, and voluntary programs. The largest non-UDIA organization is the California Milk Advisory Board; California has several mandatory programs, all administered by the Bureau of Marketing of the State Department of Agriculture. In 1983, 20 States had authority for milk promotion programs under State legislation (Krueger). In 19 of the States, producers are assessed while 4 of the States also assess handlers. These assessments are mandatory in all except one State, but seven provide for refunds when requested by any producer. Together, the 20 States represent about two-thirds of the milk produced in the country. In addition, there are advertising and promotion programs operating in six Federal orders. There are also a number of area and regional programs to which farmers voluntarily contribute. The Federal Dairy and Tobacco Adjustment Act of 1983 mandated a $0.15 deduction per hundredweight for dairy product promotion, research, and nutrition education, but allowed credits for qualifying State and regional promotion programs.

A recurring policy issue centers on the relative merits of mandatory versus voluntary promotion programs. Since any benefits of generic promotion accrue to all producers in a market, the freedom of individual producers to decide whether or not to participate poses a difficult and controversial issue. Secondly, there is the difficulty of quantifying likely rates of return from alternative levels of advertising expenditure. Moreover, Federal involvement in advertising and promotion of specific agricultural commodities raises an important economic and social issue. For example, if the public capacity to consume food is limited, generic promotion that increases consumption of one food item will reduce consumption of other foods. Thus, when there is generic advertising and promotion of numerous food commodities, effects may be partially offsetting.

1/ Results of a number of studies conducted by the Department of Agricultural Economics at Cornell University, relevant information from other studies, and an extended list of references to other research efforts and papers are presented by Kinnucan, 1980.

Dairy Product Research and Nutrition Education

Both dairy product research and nutrition education have potential longrun effects on consumption. Dairy product research falls into three categories: new product development, improvements in product quality, and cost lowering technology for processing and marketing. Most new dairy products are variants of basic products whose ages are generally measured in centuries if not millenia. While some of these variants have been quite important, revolutionary new uses for milk are not likely. The other two categories probably have considerably more impact, but the bulk of their benefits may not be felt for a decade or more after introduction.

Dairy industry support of general nutrition education and research is based on the assumption that greater nutritional awareness will ultimately increase demand for dairy products, even though there may be adverse shortrun effects. Nutritional qualities of dairy products probably warrant this assumption. However, both nutrition education and dairy product research should be viewed as longrun investments in demand with few, if any, appreciable shortrun benefits.

Changes in Dairy Product Standards

Proposed changes in fluid milk standards would increase milk solids-not-fat (S-N-F) in fluid products beyond average levels found naturally in raw milk. If adequately enforced, these standards would probably increase the total pounds of S-N-F sold in fluid products, although the resulting higher prices would reduce the volume and the total pounds of fat sold. Proponents assert that consumers prefer the taste of milk high in S-N-F and would receive more nutrition per gallon. However, the dramatic decline in sales of fortified lowfat and skim milk products in Federal order markets over the past decade suggests that consumers generally do not perceive enough benefits to justify the additional costs. While an increase from the current minimum of 8.25 percent S-N-F to one closer to the 8.6 percent average in raw milk might be justified as a deterent to the illegal addition of water by farmers or plants, economic efficiency would be enhanced by allowing consumers to choose between normal and enhanced S-N-F levels.

Federal Domestic Food Programs

Federal food programs could be changed to modestly increase consumption. The switch from direct commodity distribution programs to the food stamp program, and later changes in the food stamp program itself, have lessened the increase in dairy product consumption associated with food assistance programs. Some increase is possible in the school lunch program by making participation more attractive to students. A special milk program could be reinstated at something like its former level to increase fluid milk consumption somewhat.

The USDA under the special distribution to needy persons program distributed, through food banks and other charitable agencies, 356 million pounds of American processed cheese from the beginning of 1982 through April 1983. There is a limit, however, to this method of product disposal; high levels of free cheese distribution displace some of commercial cheese sales (Zellner and Carman).

Federal Export and Foreign Food Assistance Programs

Production of milk and dairy products continues to rise sharply in most dairy producing areas of the world. With consumption of fluid milk trending down, expansion in milk output is being channeled into manufactured dairy products. Demand for these products does not match the increased output; world stocks continue to build.

Given the lower costs of milk production in New Zealand and Australia, and the dairy product export subsidies by the European Community, there is little potential for substantial increases in U.S. dairy product exports without disrupting world markets.

While there is obviously a need for further food aid in some countries, dairy products may not be the most appropriate food to provide because of cultural differences or distribution problems.

SUMMARY AND CONCLUSIONS

The U.S. dairy industry is producing about 10 percent more milk during the early eighties than can clear the market at established prices. Such huge surpluses can benefit virtually no one in the long run. Large Treasury costs pay for resources to produce dairy products that are mostly given away at small benefit to society. Even producers who have gained temporarily from the Government program must inevitably face a period of adjustment.

Dairy price supports and Federal milk marketing orders have increased price certainty and stability for milk producers and processors for several decades. This has contributed to overall efficiency in milk production and marketing. But, these programs have sometimes raised farmers' prices above equilibrium levels and led to burdensome surpluses. Excesses in the price support level are the primary cause of the current surplus. By maintaining prices of milk for fluid use above support prices and above levels needed to assure an adequate supply, the Federal marketing order program has also contributed to the general overproduction.

Price Supports

Much of the current surplus problem traces directly to setting high price supports in 1977 and not lowering them soon enough when economic conditions turned out differently than expected. A program which had generated only small surpluses during the seventies made dairying a lucrative enterprise beginning about 1979. Dairy cow numbers discontinued their long-term downward trend in early 1980 and have risen since. The surplus has been further aggravated by strong growth in milk production per cow amounting to about 2 percent annually.

If price supports were to be eliminated suddenly, milk prices would likely drop by more than 20 percent in the short run. Prices of cull cows and replacement heifers would also fall substantially. Many farmers would be forced out of dairying. Cow numbers might well decline temporarily to less than long-term needs. Without supports, price and output fluctuations would increase. Because of the perishability of their product and the need to move it to market every day or two, dairy farmers are particularly vulnerable to such price uncertainty.

It tends to discourage the types of investment that allow milk to be produced at a lower cost. An appropriate degree of milk price stabilization by Government may actually lower average milk prices to consumers over the long run.

To clear the market under projected economic conditions for the mideighties, real milk prices would need to be 15-20 percent less than 1983 levels. This assumes that the lower farm prices are passed on to consumers in the form of lower milk and manufactured product prices. The amount of price reduction needed depends critically upon feed costs, the profitability of other farm enterprises, and off-farm employment opportunities for dairy farmers. If production is to be brought into alignment with use without undue disruption of the industry, changes in support levels should be gradual.

If the 15-20 percent lower milk prices required to balance production with use are deemed unacceptable, several alternative types of programs are available to transfer income to farmers and help keep farmers in business. These include supply control, direct or deficiency payments, and using marketing orders to increase the price of milk going into fluid consumption. All present administrative problems involve income redistributions that are objectionable to some people, and reduce economic efficiency.

Any program which is to stabilize prices or incomes over a period of several years must have a mechanism for adjusting the support level for changes in production costs and demand. The parity formula has performed this function but it has serious shortcomings. For example, it does not adequately reflect dairy feed costs which amount to about 50 percent of milk production costs. The support level was consequently low relative to feed costs in 1973-75 and high relative to feed costs in 1978-82 when the current surplus originated. Second, the current parity formula can translate relative decreases in crop prices into increases in the parity price for milk. For example, if the 10-year average price for grains declines while the price of milk remains constant, the adjusted base price for milk is raised. This may increase the parity price for milk even if the prices paid index declines.

In seeking an improved formula for adjusting support prices over time, three possibilities merit consideration. First is the use of an index or formula that specifically reflects milk production costs. Second is the use of an adjustment for increasing productivity. Third would be a formula that adjusted the support price up or down depending upon the amount of excess supplies. The best procedure for setting the support price may involve all three. The Secretary of Agriculture needs flexibility, within limits, to make further adjustments as needed.

Supply Control

Supply control involves using some incentive other than lower milk prices to motivate farmers to limit production or marketings. If an effective supply control program could be implemented, it would provide a way to transfer income from consumers to producers at less cost to Government and possibly less net loss to society than Government purchase and disposal. Certain types of supply control would enable some producers to survive who could not continue under reduced supports.

Any supply control program that is to be effective for more than a year or two must employ individual farm quotas or bases. This makes administration of such

programs costly. Quotas take on values of their own with most benefits going to the original quota holders. Rules must be established regarding transfer of quotas and entry into the industry. Unless quotas are transferable, farms would be held below their least cost levels of output. High cost producers would be kept in business while new, possibly lower cost, producers would be barred from entry. If quotas were transferable, lower cost producers could enter or expand, but the cost of the quotas would deter potential new producers with limited capital. Experience with other commodities shows that once started, quota programs are very difficult to terminate due particularly to the vested interests of quota holders.

Despite their disadvantages, supply control programs might possibly serve as temporary measures to bring production into line with use. Some countries have used cow culling payments for such purposes. However, a large portion of such payments would go for cows that would be culled anyway and, unless controls on cow numbers were imposed, farmers would soon rebuild their herds. In this country supply can be controlled more effectively by limiting marketings than by limiting cow numbers.

Paying farmers to reduce marketings below a historical base is one of the more effective forms of supply control. Participation would be voluntary based on an incentive such as a payment for each hundredweight that marketings are reduced, or the refund of an assessment if production is reduced by a specified amount. By combining assessments or deductions on production with payments for reducing production, such a program could be self-financing. This approach to supply control is subject to the disadvantages of quota programs listed above.

Another means of supply control is two-tier pricing where farmers are paid one price for a base quantity of milk and a lower price for milk produced in excess of the base. This might be implemented with a deduction on excess production. No direct Government payments to farmers would be required. If the deduction were large enough, the incentive not to exceed the base would be strong. Two-tier pricing has most of the same disadvantages as other supply control schemes. All would impose inefficiencies on the industry in order to transfer income from consumers to producers.

Deficiency Payments

Direct payments could be used to compensate farmers for lower incomes due to the lowering of supports. However, Government costs for achieving any given level of income support through direct payments on all milk produced would be much greater than through purchase and disposal. Alternatively, direct payments could be made on a specified percentage of historical production on each farm. In this way, any desired amount of income transfer could be provided with little stimulation of production. Direct payments based on historical production would do little to stabilize market prices and production. They would pose the same types of eligibility problems as quota programs. Like supply control, direct payments merit consideration mainly as temporary measures to compensate farmers for adjusting to lower supports.

Marketing Orders

Current problems with the marketing order program for milk are less pressing than those with the dairy support program. Costs for operating the program are

modest. Producers can vote orders out if they choose. Most milk processors seem willing to accept the required recordkeeping and audits in exchange for the stability and orderliness that the orders provide. The main reason for being concerned with milk marketing orders is the possibility that they lead to inefficiences, including excess production in some areas, and that they make fluid milk more expensive to some consumers or incomes less to some producers than they need to be.

As the price support program is changed to bring milk production more in line with use, pressures for changing the marketing order program will mount. Producers will look for orders to set higher prices for fluid use to make up for the lower support prices. Producers in the surplus areas will be looking for order changes that help move milk to deficit markets at Class I prices. Calls for changing order provisions to better accommodate reconstituted milk and other technologies will continue.

Pricing under marketing orders is a form of administered pricing which combines pricing to processors by use class and paying producers a blend price. Since the minimum differentials between use classes are set ahead of time, much uncertainty about price is eliminated. Administered pricing of milk came into existence because milk producers were especially vulnerable to pricing abuses by processors. Producers' vulnerability is due in large part to the perishability of raw milk and their resulting needs for dependable outlets, combined with fluctuating output, imbalance in size between individual producers and processors, and the small number of processors in each marketing area. Marketing orders assure farmers or their cooperatives operating within an order of equal prices, subject to location differences, thereby lessening the chance of a processor working one producer against another in bidding down the price. Cooperatives are unable to achieve this kind of price assurance without orders because some producers can gain by staying out of the cooperative and making price concessions in order to obtain outlets for themselves, particularly during periods of large supplies.

Pricing by use class provides a workable means of administering prices which most sellers and buyers have found acceptable for nearly 50 years. It can be used as a means of raising average returns to producers by exploiting differences in demand for fluid and manufacturing products. This requires a price difference between milk for fluid use and milk for manufacturing use that exceeds the cost difference in serving the two different outlets. As a means of raising farmers' incomes, such price discrimination has similarities to supply control. Whereas supply control limits quantities available for all consumers, price discrimination, in effect, limits quantities for fluid consumers. Although supply control reduces total production while price discrimination increases total production, both types of programs reduce total economic product for society as a whole. And, while effective supply control tends to benefit all producers at the expense of all consumers, price discrimination benefits Grade A producers and manufactured product consumers at the expense of fluid consumers and Grade B producers.

The actual amount by which class price differentials exceed costs, if any, is difficult to ascertain and varies among marketing areas. The fact that pool eligibility has attracted many more Grade B producers to convert to Grade A than needed suggests strongly that a degree of price discrimination has existed. However, since the Class I differentials have been held constant for over a decade while inflation has raised costs, the relative amount of price discrimination has declined over time.

The existing price differentials between orders overstimulate production in some regions. Class I prices for the various orders are set to increase about $0.15 per hundredweight in areas east of the Rocky Mountains for every 100 miles away from Eau Claire, Wis. Actual hauling costs are more than $0.30 per hundredweight per 100 miles. Moreover, there is no reason that milk prices should differ by hauling costs along routes that milk does not move. Hence, in areas that are more than self-sufficient in fluid milk, such as the Northeast, the Class I price tends to be too high. In areas that normally produce less than they use, the price tends to be too low. These problems could be reduced by increasing the location differential and switching from a single basing point to a base zone or zones made up of those areas which are normally fully self-sufficient in fluid milk production including reserves.

Within individual orders, the locational price differences have grown out of date, contributing to inefficient movements of milk. Procedures for regular updating of price zone boundaries and price differences between zones need to be developed.

Paying uniform blend prices to all producers subject to location differentials and certain other adjustments does not adequately reward producers for servicing the fluid market. Numerous proposals have been made for redistributing marketing order pool revenues to cover marketwide services and more effectively promote movement of milk into fluid uses. These include payments for hauling and for providing balancing services, two-tier pooling schemes, and lowering prices to manufacturers during the flush season. In most cases, these uses of pool revenues are advocated by full service cooperatives already committed to providing the services. Providing payments from pool revenues for bona fide marketwide services has some economic justification, but many problems exist in identifying services to be covered and determining their value.

A continuing issue is to what extent marketing order minimum prices should cover marketing services that cooperatives perform such as balancing. In some areas, the Class I price essentially covers these marketing services. In other areas, the cost of providing the services is covered by over-order charges. This means that the inter-order price differentials are relating milk prices that include marketing services in one area to prices in other areas that do not include corresponding services.

Including the cost of marketing services under the minimum order price would help assure farmers' cooperatives returns on their investments for providing these services, but would require further Government involvement in milk marketing. Estimating costs of providing the services presents many problems since they would differ considerably between firms even within a market area.

The pricing scheme which would promote greatest efficiency is one with small class price differences in all surplus producing areas and differentials just high enough in deficit areas to attract the outside milk needed for fluid use. Producers would be paid according to the services they performed. Efficiencies would be gained to the extent that administered prices were based more directly upon the costs of the services associated with the milk. But determining costs and administering a more directly cost-based pricing system would be difficult.

Reconstitution of milk from concentrated ingredients offers possibilities for providing some consumers a product virtually equivalent to fresh milk at a lower price. Reconstituted milk is generally more palatable when mixed with fresh milk.

Commercial reconstitution of milk is generally unprofitable under current Federal marketing order pricing provisions, which make the ingredients at least as costly as fresh fluid milk to the firm doing the reconstitution. Moreover, sales of reconstituted milk are either prohibited or prices regulated by about half of the States.

Compared to fresh fluid milk, reconstituted milk involves added costs for processing, but lower costs for transportation and market balancing. Current order provisions force the firm that reconstitutes milk to pay for market balancing services, as represented by Class I differentials, which it does not need or use. If these charges were eliminated, reconstitution could provide cost savings by partly supplying fluid milk needs in some high cost-of-production areas, particularly during the fall and winter. Fresh fluid milk would continue to have a cost advantage in most areas.

Several possibilities exist for bringing the ingredient costs of the reconstituted product more in line with actual costs. These would generally lead to substantial lowering of Class I price differentials or abandonment of classified pricing. In its place, a system of administered prices for both producers and processors based more directly on costs might possibly be implemented to lend stability and price certainty to milk markets while obtaining some of the efficiencies that reconstitution allows.

Overall losses to society from the pricing inefficiencies imposed by marketing orders are relatively small, probably less than 1 percent of the value of milk produced. These losses must be weighed against the gains from orderliness and stability brought about by orders. However, orderliness and stability should be attainable through a system of administered pricing or contracting based upon prices that are more nearly in line with costs. This might be accomplished under the order system by adjusting price differentials and by developing means to pay producers more in line with the services they provide to the market.

In summary, the level of price support is the key dairy program element affecting the well-being of society and costs to Government. Stabilization benefits are achievable and economic waste can be avoided with lower real levels of price support than existed during the early eighties. Supply control and direct payments are likely to lead to serious economic distortions, except possibly when used as temporary measures to compensate producers for making needed adjustments. A number of possibilities merit consideration for reducing the economic distortions associated with Federal milk marketing orders while promoting orderliness and stability in milk pricing.

This study, like its predecessors, leaves many important questions about dairy programs only partly answered. Improved measures of the basic economic relationships and more detailed analyses of specific programs are needed to provide more complete answers. Among the economic relationships that need further quantification are: the effects of price uncertainty and instability on supply response; the nature of the instabilities that would arise with fewer or no regulations; the costs of providing marketing services; the value of product donations; and the effects of advertising and promotion. Particularly important to future dairy program analyses are sound studies of demand and supply relationships. Broader areas which need study, and of which dairy is only a part, are cooperative policy and trade policy.

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APPENDIX A: QUANTIFYING EFFECTS OF ALTERNATIVE DAIRY PRICE AND INCOME SUPPORT PROGRAMS

Part of this study involved computer simulation of the effects of specific dairy programs over the period 1983-84 to 1988-89. Results of these simulations appear as a separate report.1/ Selected results are summarized here to underscore some of the important differences between major types of programs. Further implications of the different programs for the welfare of producers and consumers are also described.

Any effort to quantify the longer term effects of dairy programs is subject to errors due to unforeseen events and changes in the underlying economic relationships. Moreover, relatively little is known about some of the key relationships, especially the relationship between instability and supply response. Until these relationships can be measured with more precision, no firm conclusions can be drawn about the effects of particular dairy programs on economic efficiency or total social product. Somewhat more can be said about the effects of programs on the distribution of income or welfare among milk producers, dairy product consumers, and general public. Moreover, differences between programs can generally be predicted more accurately than specific prices and quantities resulting from a particular program. Thus, considerable insight can be gained from comparing results of different dairy programs projected with economic models, even though individual projections are subject to error.

Simulation Results

Three major types of price and income support programs are considered here: price supports with Government purchase and disposal; payments for reducing marketings; and direct payments based on current or historical output. Simulation results for five specific programs were selected to illustrate different effects of these major types of programs. The first is a price support program with supports near the market-clearing price. Each of the remaining four would raise the support level about 15 percent above the market-clearing level, one with price supports only, one with payments for reducing production financed through assessments, and the last two involving direct payments, one on current production and the other on base production only.

Except for the program differences, the conditions assumed for all simulations were identical. These include: 1 percent annual growth in population; 2-3 percent annual growth in real income; 5-6 percent annual increase in processing and marketing costs; and 4-5 percent annual increase in feed and cattle prices.

Three-year averages of selected quantities and prices projected to occur 4 to 6 years after program initiation are shown in appendix table 1. Comparison of these averages brings out some important differences in longer term effects between programs.2/

1/ See Salathe, 1984. The FAPSIM model used in the simulations is described in Salathe, Price, and Gadson, 1982.

2/ Readers interested in the intervening time period or other details should consult Salathe, 1984.

Appendix table 1--Projected quantities and prices for alternative dairy programs 4-6 years after implementation 1/

Item	Program				
	Price supports at 50 percent of parity	Price supports at 60 percent of parity	Paid reduction supported by assessment	Direct payments: Current marketings	Direct payments: 85 percent of base marketings
Cows (mil.)	10.14	10.63	9.78	10.63	10.18
Milk production (bil. lbs.)	137.7	145.5	134.1	145.5	138.5
CCC removals (bil. lbs.)	2.0	13.1	3.0	3.0	3.0
CCC cost (bil. dollars)	0.17	2.3	0.45	8.34	1.96
All milk price ($/cwt.)	15.29	17.06	17.06	11.54	15.66
Total receipts including net payments (bil. dollars)	20.8	24.5	23.2	24.5	23.1
Consumer expenditures for dairy products (bil. dollars)	53.6	56.1	56.7	47.6	54.0

1/ Values shown are averages of estimates made by Salathe 1984 for the 3 years 1986-87 to 1988-89 for program changes made in October 1983.

The first column shows expected results for a price support program at the 50 percent of parity level.1/ This is 15-20 percent lower than the 1982-83 support level. It is approximately a market-clearing level of support; CCC removals are projected at 2 billion pounds annually with Government costs of about $170 million.

The remaining four program alternatives summarized in appendix table 1 involve higher levels of support approximating 60 percent of parity. For a straight price support and purchase program as shown in column 2, estimated CCC removals are 13.1 billion pounds at a cost of $2.3 billion. The third column illustrates a paid reduction in marketings program. Payments would be financed through deductions on each hundredweight of milk marketed so that the program is self-financing. Column 4 represents a program of direct payments on current marketings to assure farmers a return equal to a 60 percent of parity target price. The program represented by column 5 also involves direct payments, but only on 85

1/ Since the simulation procedure allows for increasing costs associated with continuing inflation, the support level was also increased over time. Otherwise, supports would become ineffective. Parity was used as an index for increasing the support price because of its familiarity to readers. The deficiencies of parity as a price index for dairy price supports are discussed in the text of this report.

percent of historical production. Hence, it provides no incentive to increase production beyond the market-clearing level.

Program alternatives 2 through 5 each raise farmers' gross receipts 11-18 percent above those for alternative 1. Costs to Government would be lowest for the third alternative which involves using an assessment and paying farmers not to produce. One should note, however, that net Government costs for price supports, and perhaps direct payments on a percentage of base production, could also be reduced by combining these programs with an assessment. Government costs would be extremely high for a program of direct payments on current production, but consumers would be provided a larger quantity of dairy products at substantially lower cost.

Welfare Effects

The price, total receipts, and consumer expenditure estimates shown in appendix table 1 do not fully reflect how well producers and consumers fare under the different programs. In particular, production costs and the effects of consuming more or fewer dairy products are overlooked. One way to overcome these shortcomings is to employ measures of economic surplus. Consumers' surplus is the difference between what consumers would be willing to pay for a product and what it costs them. Producers' surplus or rent is the return to owners of fixed inputs, such as land, facilities, skilled labor, and management, above the return these inputs could earn in their next best use. Consumers' surplus is represented by the area between the demand curve and the price line while producers' surplus is represented by the area between the supply curve and the price line. Total consumers' surplus or total producers' surplus generally cannot be estimated since little is known about the demand and supply curves away from their point of intersection. However, enough is known about these curves near the point of intersection to allow changes to be compared in that vicinity. Consequently, in appendix table 2, consumers' and producers' gains and losses under alternative programs are measured in terms of differences from the base program, which is price supports at 50 percent of parity.1/ For example, suppose that the price of a product is raised through Government purchase and disposal from p_1 to p_2 as depicted in appendix figure 1. This price increase reduces consumers' welfare by area a. Producers gain by the sum of areas a and b. The cost to Government is represented by $p_2 \times (q_2 - q_1)$.

The gains and losses shown in appendix table 2 were calculated from the conditional projections in appendix table 1 using the following formulas where A is the base program and B is the alternative program.

Producers' gain = 1/2 (Production A + Production B) x (Price B - Price A) + Direct payment.

Consumers' gain or loss = 1/2 (Consumption A + Consumption B) x (Price B - Price A).

CCC gain or loss = CCC cost A - CCC cost B.

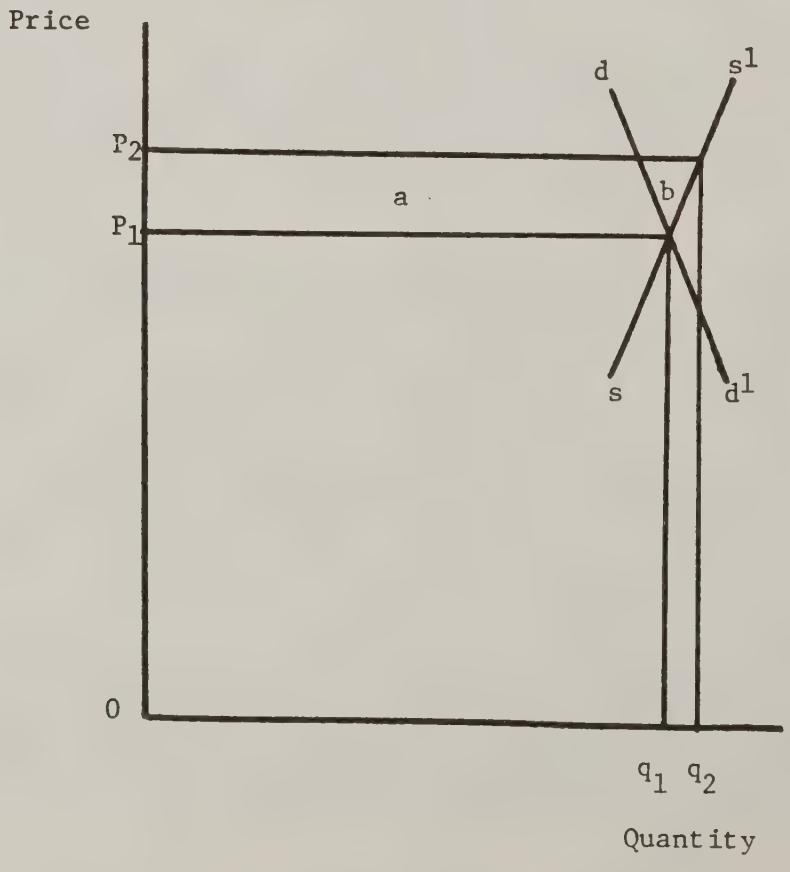
1/ Consumers' and producers' surplus as used here are only approximate measures of economic welfare. For more precise methods, see McKenzie. Lack of precision in estimating the underlying demand and supply relationships appears to be the largest source of error in the estimates reported here.

Appendix table 2--Estimated longrun annual gains and losses for producers and consumers from alternative programs, relative to supporting prices near the market-clearing level, excluding gains from stabilization

Program effect	Price supports at 60 percent of parity	Paid reduction supported by assessment	Direct payments	
			Current production	85 percent of base production
		Billion dollars		
Producers' gain	2.51	2.35	2.67	2.11
Consumers' gain or loss	-2.37	-2.36	5.22	- .50
CCC gain or loss	-2.06	- .24	-8.10	- .72
Net gain or loss 1/	-1.92	- .25	- .21	- .11

1/ Excludes benefits derived from donations.

Appendix figure 1--The effects of government purchase and disposal on consumers' and producers' welfare



Society's net gain or loss = Producers gain + Consumers' gain or loss + CCC gain or loss.

Conclusions to be drawn from appendix table 2 include:

1. Price supports and paid reduction in output cost consumers more than $0.90 for every dollar returns to producers' are increased. Price supports require roughly another $0.80 from taxpayers for buying surpluses which must be disposed of, possibly with little benefit to society.

2. Direct payments on current production would be very costly to taxpayers. Consumers would benefit more than producers from such payments.

3. Direct payments on base production would transfer income from taxpayers to farmers with relatively little impact on consumers.

4. All of these programs impose losses on society as a whole due to misuse of resources. For a price support program where donations have little value to society, the loss could approach $1.9 billion or about 8 percent of the nearly $25 billion worth of milk produced. If the surplus were advantageously disposed of, the losses to society could be much less, more like the other types of programs. For the other programs, the losses are generally no more than 1 percent of the value of milk produced. This could quite conceivably be exceeded by the gains from increased stability and price certainty brought about by the programs.

APPENDIX B: ANALYSIS OF ALTERNATIVE SETS OF CLASS I PRICE DIFFERENTIALS

Regional impacts of alternative sets of Class I price differentials were estimated using the Dairy Market Policy Simulator (DAMPS) developed by Novakovic et al.1/ This computer simulation model estimates impacts of alternative pricing schemes on retail prices, marketings, and commercial sales of milk and dairy products by marketing order or region throughout the country. Selected results are summarized in this appendix.

Five alternative pricing scenarios were analyzed which would restructure Federal and State milk marketing order minimum Class I prices to correspond more nearly to actual transportation costs. All assume lowered price supports with Government removals equal to 1 percent of marketings. Prices and production for the five alternative pricing scenarios are compared to results for a base scenario BASEEQ, in which current Class I differentials apply. The assumptions underlying all six scenarios are summarized in appendix table 3.

The rationale used for structuring Class I prices is that prices in any deficit area should be at least equal to the cost of milk imported into that area from the least cost source of supply.2/ Hence, one must identify the location of the exporting region(s) and determine the base price(s) in those region(s) and the transportation costs. The five scenarios shown in appendix table 3 involve combinations of three different base points or regions and two assumptions about transportation costs.

The cost of transporting bulk milk is assumed to be 32.5 cents per hundredweight per 100 miles for scenarios BASEEQ, BP1, BP2, and BP3. For the latter three, the Class I prices increase relative to the price at the base point(s) according to that cost. The pricing scenarios referred to as RECON2 and RECON3 relate Class I prices in a region to the base Class I price plus the cost of transporting bulk milk or a reconstitutable milk ingredient, either condensed or dried, whichever is cheaper. The additional cost of producing and reconstituting condensed or dried milk is added to its transportation cost. Under this scheme, least cost movements up to 375 miles are in the form of bulk fluid milk. Between 375 and 900 miles, least cost movement is in the form of condensed milk (approximately 32 percent solids). Beyond 900 miles, movement as dried milk products is cheapest. The procedure used equates milk prices in each region with the cost of supplying milk from the cheapest alternative source, including reconstituted milk. It does not presume to fully analyze all the issues related to reconstituted milk.

Three alternative sets of spatial price relationships are examined. Currently, Class I prices east of the Rocky Mountains are generally related to the price in northern Wisconsin and Minnesota plus a transportation differential, while prices in the Far West are lower than what would correspond to a Wisconsin/Minnesota based price and do not exhibit a strong transportation cost related pattern. This single base point spatial pattern is assumed in BP1 as well as in BASEEQ. In all cases, the pricing pattern in the Far West is adjusted only to keep it

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1/ For a description of the DAMPS model, see Novakovic, et al. 1980. More detailed results are presented in Novakovic, Pratt and Batista.

2/ This implies that local milk would not be supplied at a lower price. Some of the analyses which follow partially test this assumption.

Appendix table 3--Principal characteristics of alternative Federal order pricing scenarios

Name	Transportation differential cents/cwt. per 100 miles	Class I price in base area	Base pricing points
BASEEQ	Current (approx. 14 plus premiums)	Class III price plus current Class I differential and over-order premiums 1/	Wisconsin/Minnesota and Far West
BP1	32.5	Base Class III price plus .40 in base zone, based on transportation differential east of Rockies	Wisconsin/Minnesota and Far West
BP2	32.5	Same as BP1	Wisconsin/Minnesota, New York, and Far West
BP3	32.5	Same as BP1	A broad zone north and west of Virginia, Kentucky, Missouri, Kansas, Oklahoma and Texas, and the Far West
RECON2	32.5 up to 375 miles, 10.83 up to 900 miles, 4.06 thereafter	Same as BP1	Same as BP2
RECON3	Same as RECON2	Same as BP1	Same as BP3

1/ Given Class I price levels, minimum Class III prices are those which result in net Government purchases equal to 1 percent of total marketings of raw milk.

similar to prices in the rest of the country; a strict transportation differential is not applied.

For east of the Rockies, two additional basing point assumptions are examined, one adding a second base point in New York and a second employing a base zone extending from the Midwest to the Northeast. Although the Wisconsin/ Minnesota region has the largest reservoir of exportable milk--milk in excess of local Class I market needs--other regions also have exportable milk supplies. The Northeast, centering on upstate New York, ranks second to the Wisconsin/ Minnesota region by this criterion; hence, BP2 and RECON2 have a price surface with base points in the

with base points in the Wisconsin/Minnesota area and New York. In BP3 and RECON3, the concept of a base zone is employed. Based on historical production and use, States in the South are identified as being inherently deficit or importing areas, whereas, the rest of the country (east of the Rockies) is identified as having exportable milk supplies. Thus, Class I milk prices in all areas within this broad base zone outside the South are held equal, while Class I prices increase from the periphery of this zone based on the appropriate transportation differential.

The minimum Class I differential in the base zone(s) is somewhat arbitrarily set at 40 cents per hundredweight in all cases to partly reflect the added cost above the manufacturing price for serving the fluid milk market, and to be consistent with a minimum city zone price, given a comparable intra-order location differential.

In all of the pricing scenarios, minimum Federal order prices are assumed to be the effective market prices; in other words, there are no over-order prices. If over-order premiums were largely based upon transportation costs, incorporating actual transportation costs into the administered price surface would essentially eliminate the need for over-order prices. If additional premiums are needed to cover the cost of various services provided by cooperative suppliers, these service charges should be approximately constant across all cases and would not significantly affect results. Whether cooperatives would or could charge over-order prices for other reasons and whether the level of such premiums would vary across these pricing schemes is unknown. Insofar as several of the alternatives represent significant departures from the current Class I price structure in some regions, it would not be surprising if cooperatives attempted to negotiate higher prices in regions in which minimum order prices are reduced the most; however, it is not clear whether any such negotiated prices could be maintained in the longer run.

Price support policy as well as Federal order policy affects the general level of prices. For these Class I pricing scenarios, price support levels were chosen which result in a very low level of Government purchases, only 1 percent of total milk marketings. The Class III (or Grade B) milk price levels consistent with this objective for each Class I pricing scenario are shown in appendix table 4.

Aggregate results for the various alternatives are presented in appendix table 5. Under the market clearing objectives of these price scenarios, alternatives that result in relatively high average Class I prices (appendix table 6) have relatively low Class III prices (appendix table 4), while average farm prices differ little across scenarios (appendix table 7). Milk marketings generally increase with increases in average prices (appendix table 8).1/ Fluid milk consumption varies somewhat with Class I prices but is very inelastic (appendix table 9).

1/ Milk marketings reported in appendix table 8 include milk shipped to an area as well as local production; hence, the reader will observe some cases in which milk prices increase (decrease) relative to BASEEQ but marketings decrease (increase) relative to BASEEQ. Local production rises and falls in accordance with normal expectations; however, interarea milk shipments depend on interregional price differences within each scenario, not regional differences relative to BASEEQ.

Appendix table 4--Class III (and Grade B) milk prices under alternative Federal order pricing scenarios

Scenario	Actual	As a percentage of BASEEQ
	Dollars per hundredweight	Percent
BASEEQ	10.76	--
BP1	10.58	98.3
BP2	10.79	100.3
BP3	11.17	103.8
RECON2	10.92	101.5
RECON3	11.22	104.3

Farmers in the Northeast receive the highest price and market the most milk when Class I prices are highest there, i.e., under BP1 when the transportation differential is the greatest and New York is not a base point. Farmers' prices in the Northeast are lowest under the pricing scenarios that use the broad base zone (BP3 and RECON3), especially when the transportation differential is higher (BP3).

Corn Belt and Mountain region farmers prosper most under the scenarios having a New York base point (BP2 and RECON2) and face lowest prices when they are included in the base zone (BP3 and RECON3).

In the Lake States and Prairie regions, which have very low Class I utilization, farmers are best off when the broad base zone is used (RECON3 or BP3) or when prices are left alone (BASEEQ). This is primarily because Class III prices are highest under those scenarios, and that benefits the lowest Class I utilization regions the most. Conversely, prices for Lake States and Prairie farmers are lowest under the scenario having the highest overall Class I prices (BP1).

Farmers in the Southeast and South Central regions receive the highest farm prices when Class I prices are highest (BP1 and BP2) and particularly when there are two base points in the distant north (BP2). Prices are lowest in these regions when transportation differentials are related to the cost of shipping reconstitutable ingredients (RECON2 and RECON3).

Appendix table 5--U.S. aggregate results for alternative Federal order pricing scenarios

Item	BASEEQ	BP1	BP2	BP3	RECON2	RECON3
Milk used by plants (mil. lbs.)	131,006	131,397	131,130	130,344	130,742	130,284
Gross farm value:						
Average (dollars/cwt.)	11.63	11.67	11.64	11.51	11.57	11.49
Total (mil. dollars)	15,228	15,327	15,267	14,998	15,126	14,973
Returns over direct cost:						
Average (dollars/cwt.)	4.10	4.13	4.14	4.02	4.05	3.99
Total (mil. dollars)	5,371	5,427	5,429	5,240	5,295	5,198
Commercial sales (mil. lbs. milk equiv.):						
Fluid milk	53,246	53,193	53,327	53,557	53,389	53,605
American cheese	48,828	49,160	48,770	48,100	48,539	48,049
Butter	21,735	21,836	21,717	21,513	21,647	21,498
Class II	16,849	16,895	16,840	16,744	16,807	16,737
Consumer expenditures (mil. dollars)	29,727	29,756	29,737	29,581	29,660	29,563
Retail prices:						
Fluid milk (cents/1/2 gal.)	100.3	102.2	99.8	95.4	98.1	94.9
American cheese (cents/lb.)	222.3	219.0	222.8	229.7	225.9	230.3
Butter (cents/lb.)	161.5	159.0	162.0	167.3	164.3	167.7
Ice cream (cents/1/2 gal.)	184.6	183.2	184.8	187.8	187.2	188.0

Appendix table 6--Average Class I price in Federal and State orders by region, BASEEQ and others as a percentage of BASEEQ

Region 1/	BASEEQ	BP1	BP2	BP3	RECON2	RECON3
	Dollars per cwt.	Percent of BASEEQ				
Northeast	13.09	107.7	94.5	88.5	94.8	88.8
Corn Belt	12.62	99.3	101.0	92.4	100.0	92.8
Lake States	12.27	94.2	95.9	94.3	97.0	94.7
Southeast	14.12	105.0	105.7	97.9	93.0	92.1
South Central	13.28	105.0	106.6	99.0	98.5	96.6
Prairie	12.55	98.1	99.8	95.3	99.7	95.7
Mountain	12.78	101.6	103.2	90.5	98.9	90.9
Southwest	12.37	97.2	98.9	93.5	99.3	93.9
Northwest	12.39	97.7	99.4	93.4	99.9	93.8
United States	12.92	102.6	99.5	93.0	97.1	92.4

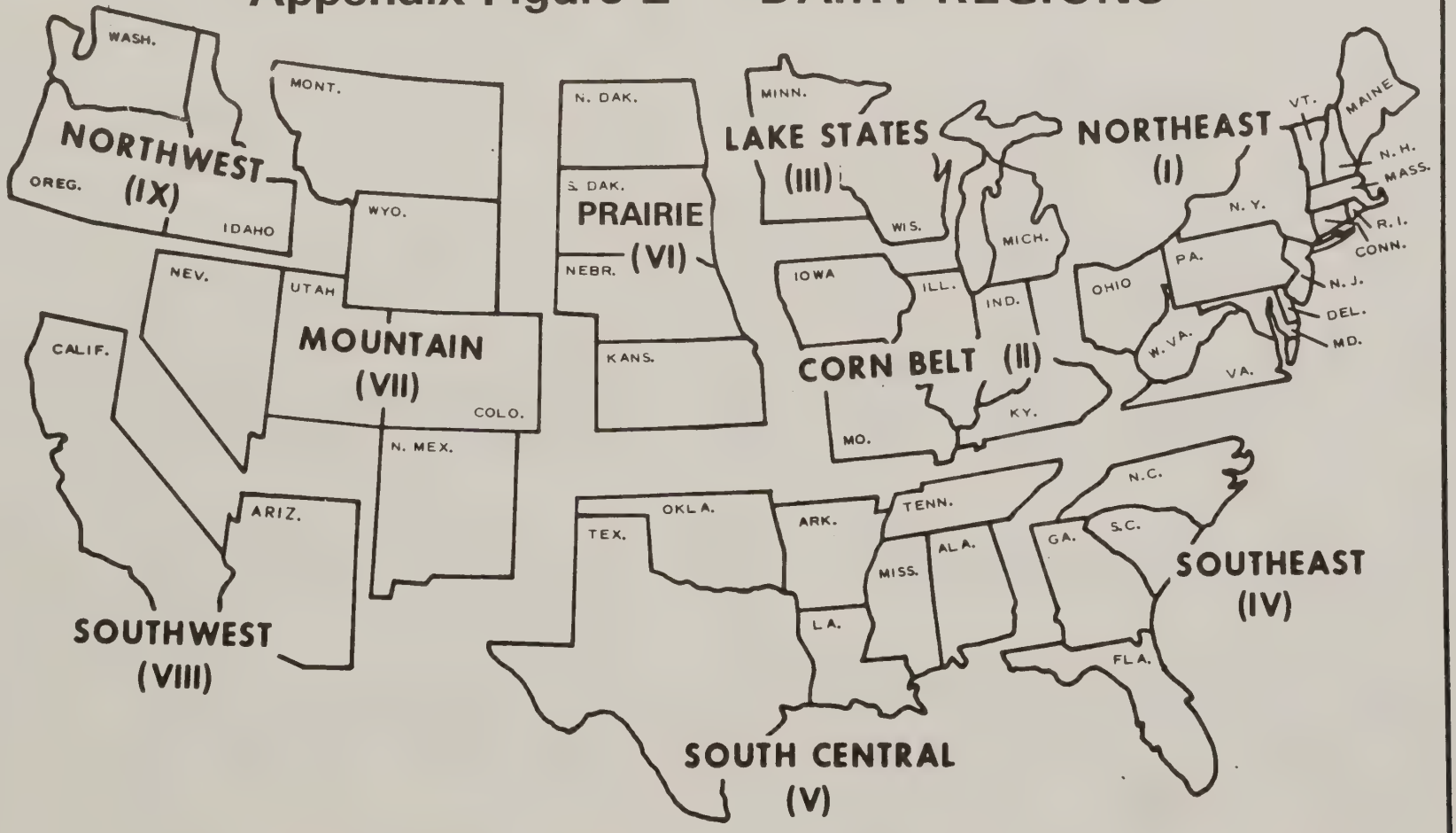
1/ See appendix figure 2 for region delineations.

Appendix table 7--Average farm price of all milk by region, BASEEQ and others as a percentage of BASEEQ

Region 1/	BASEEQ	BP1	BP2	BP3	RECON2	RECON3
	Dollars per cwt.	Percent of BASEEQ				
Northeast	11.81	103.7	98.2	95.8	98.1	96.2
Corn Belt	11.50	98.7	100.3	99.0	100.8	99.4
Lake States	11.00	97.6	99.5	102.2	100.7	102.6
Southeast	13.33	103.1	104.0	98.9	94.5	94.6
South Central	12.41	102.2	103.9	100.4	98.7	99.0
Prairie	11.22	98.3	100.2	101.4	101.1	101.9
Mountain	11.93	100.0	101.8	95.7	99.6	96.1
Southwest	11.52	97.8	99.7	98.7	100.4	99.1
Northwest	11.38	98.1	99.9	99.6	100.7	100.0
United States	11.63	100.3	100.1	99.0	99.5	98.8

1/ See appendix figure 2 for region delineations.

Appendix Figure 2 - - DAIRY REGIONS



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Appendix table 8--Total milk used by plants by region, BASEEQ and others as a percentage of BASEEQ 1/

Region 2/	BASEEQ	BP1	BP2	BP3	RECON2	RECON3
	Mil. lbs.	Percent of BASEEQ				
Northeast	34,002	101.5	99.1	97.7	98.6	98.0
Corn Belt	17,916	100.6	102.1	98.6	100.3	98.5
Lake States	30,798	97.9	98.3	101.7	97.4	101.8
Southeast	6,166	102.2	102.4	98.4	101.6	99.2
South Central	11,740	104.2	103.6	101.5	107.4	98.9
Prairie	5,627	98.6	99.4	100.2	99.6	100.5
Mountain	3,507	102.7	102.2	96.4	104.3	97.7
Southwest	15,215	99.3	99.9	99.2	98.4	99.6
Northwest	6,035	98.6	99.9	99.9	101.8	99.4
United States	131,006	100.3	100.1	99.5	99.8	99.4

1/ This includes local production plus interregional shipments.
2/ See appendix figure 2 for region delineations.

Appendix table 9--Fluid (Class I) milk sales by region, BASEEQ and others as a percentage of BASEEQ

Region 1/	BASEEQ	BP1	BP2	BP3	RECON2	RECON3
	Mil. lbs.	Percent of BASEEQ				
Northeast	16,490	99.9	101.0	100.9	100.4	100.9
Corn Belt	7,026	100.1	99.9	101.0	100.0	101.0
Lake States	4,719	100.4	100.3	100.4	100.2	100.3
Southeast	4,710	99.3	99.2	97.7	101.0	101.2
South Central	7,638	99.5	99.3	101.7	100.1	100.4
Prairie	1,421	100.2	100.1	99.2	100.1	99.2
Mountain	2,017	100.2	99.9	100.9	100.1	100.9
Southwest	6,993	100.2	100.0	100.6	100.0	100.6
Northwest	2,232	100.0	100.0	100.0	100.0	100.0
United States	53,246	99.9	100.2	100.6	100.3	100.7

1/ See appendix figure 2 for region delineations.

Mostly because of the design of the scenarios, farmers in the Northwest and Southwest (Far West) are largely indifferent to these price changes. Probably the most detrimental pricing structure for farmers in the West is the one with the highest Class I prices east of the Rockies (BP1).

All of these pricing scenarios generally result in production levels sufficiently high in each marketing area to cover most, if not all, of the Class I market requirements for that marketing area. In no case does a pricing structure decimate a production area or result in a consumption area becoming largely dependent on another area for its Class I milk. However, these pricing alternatives do have different effects on the level of intermarketing area shipments of raw milk and dairy products. Interarea shipments of raw milk (or reconstitutable ingredients) to fluid processors are considerably higher under the reconstituted milk pricing scenarios (RECON2 and RECON3). In addition, interarea milk movements to fluid processors are lowest under BASEEQ and BP3. This suggests that the current combination of partly regulated, partly negotiated prices result in a combination of incentives to stimulate local production and minimize interarea transportation. However, it also illustrates that if Class III prices are increased, a transportation related Class I differential in the areas having milk available for export might not be needed and that a transportation based differential in the southern, deficit areas will generate sufficient production to cover most local Class I requirements.

Manufactured product markets are affected by similar factors. The pricing scenarios which decrease milk production in the South, for example, result in much smaller quantities of milk available for manufacturing in those areas and intermarket shipments of manufactured products increase accordingly.

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